

Changes in force: C 3

TM 11-5820-215-35

*C 3

CHANGE }

No. 3 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 12 April 1967

DS, GS, and Depot Maintenance Manual MODULATOR-OSCILLATOR GROUP OA-2180/FRT-51

TM 11-5820-215-35, 15 July 1960, is changed as follows:

The title is changed as shown above.

Page 2, paragraph 1 (as changed by C 2, 12 Feb 64). Delete subparagraph *d* and substitute:

d. Report of errors, omissions, and recommendations for improving this manual by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to Commanding General, U. S. Army Electronics Command, ATTN: AMSEL-MR-NMP-AD, Fort Monmouth, N. J. 07703.

Paragraph 1.1 (as changed by C 2, 12 Feb 64). In line 7, after types, delete 4, 6.

Page 97, figure 76. Make the following changes: Add a dashed arrow to the upper right of XK9501. Identify the arrow as "C9507 (HIDDEN)."

Add a dashed arrow to the upper left of XK9501. Identify the arrow as "C9506 (HIDDEN)."

Page 98, figure 77. Make the following changes: Add E9501 and E9503 to callout V9501.

Add E9502 and E9504 to the callout V9502.

Page 99, figure 79. Delete callout J-506 (right side), and substitute J501.

Page 100, figure 80 (part 1 of 2). Delete callout C603 (left side), and substitute C604.

Page 101, figure 80 (part 2 of 2). Delete callout L601 (left side), and substitute L603.

Page 113, figure 94. Delete callout C4502 (next to C4510), and substitute C4508.

Page 115, figure 97. Delete callout R4104 (next to C4119), and substitute R4101.

Page 117, figure 100. Delete callout R225 (above R233), and substitute R255.

Page 118, figure 101. Make the following changes: Add an arrow to transformer T4001 (upper right), and identify it "T4001."

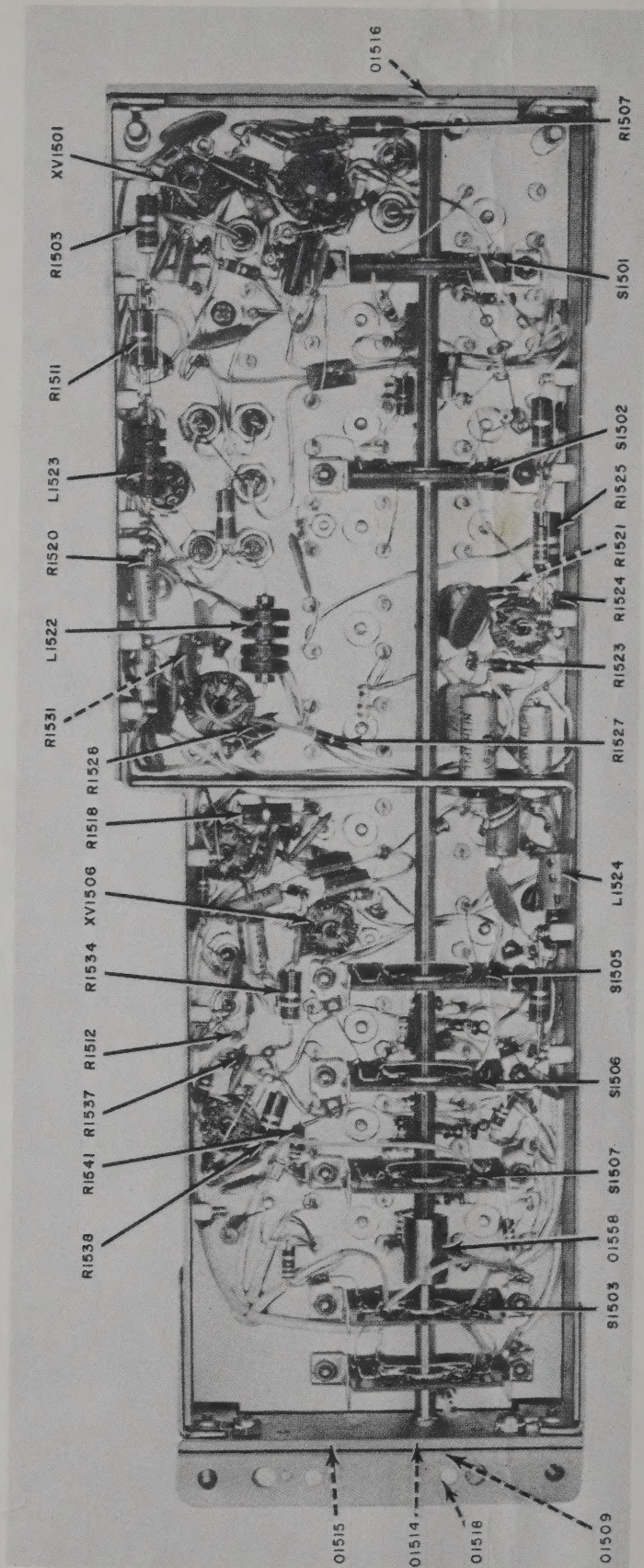
Add a dashed arrow to tube beneath C213 (lower left), and identify it "TP202 (HIDDEN)."

Add a dashed arrow to tube beneath T209 (lower left), and identify it "TP203 (HIDDEN)."

Page 119, figure 102. Add E9601 to callout INSULATOR POST.

Page 129, figure 106. Delete figure 106 (part 2 of 2) and substitute:

* This change supersedes C 1, 16 October 1961 and C 2, 12 February 1964.



TM5820-215-35-106(2)-C3

Figure 106—Continued (part 2 of 2) (Superseded).

✓ Page 130, figure 107. Add an arrow to capacitor directly above capacitor C1576, and identify it "C1550."

✓ Page 132, figure 108. Make the following changes: Add 0899.346 and 0899.347 to callout POTENTIOMETER GEARS AND GEAR CLAMPS.

✓ Add 0899.348 to the callout Dial Mask Spring.

✓ Add 0899.416 to the callout Upper Positioning Pulleys.

✓ Page 134. Delete figure 110 and substitute new figure 110.

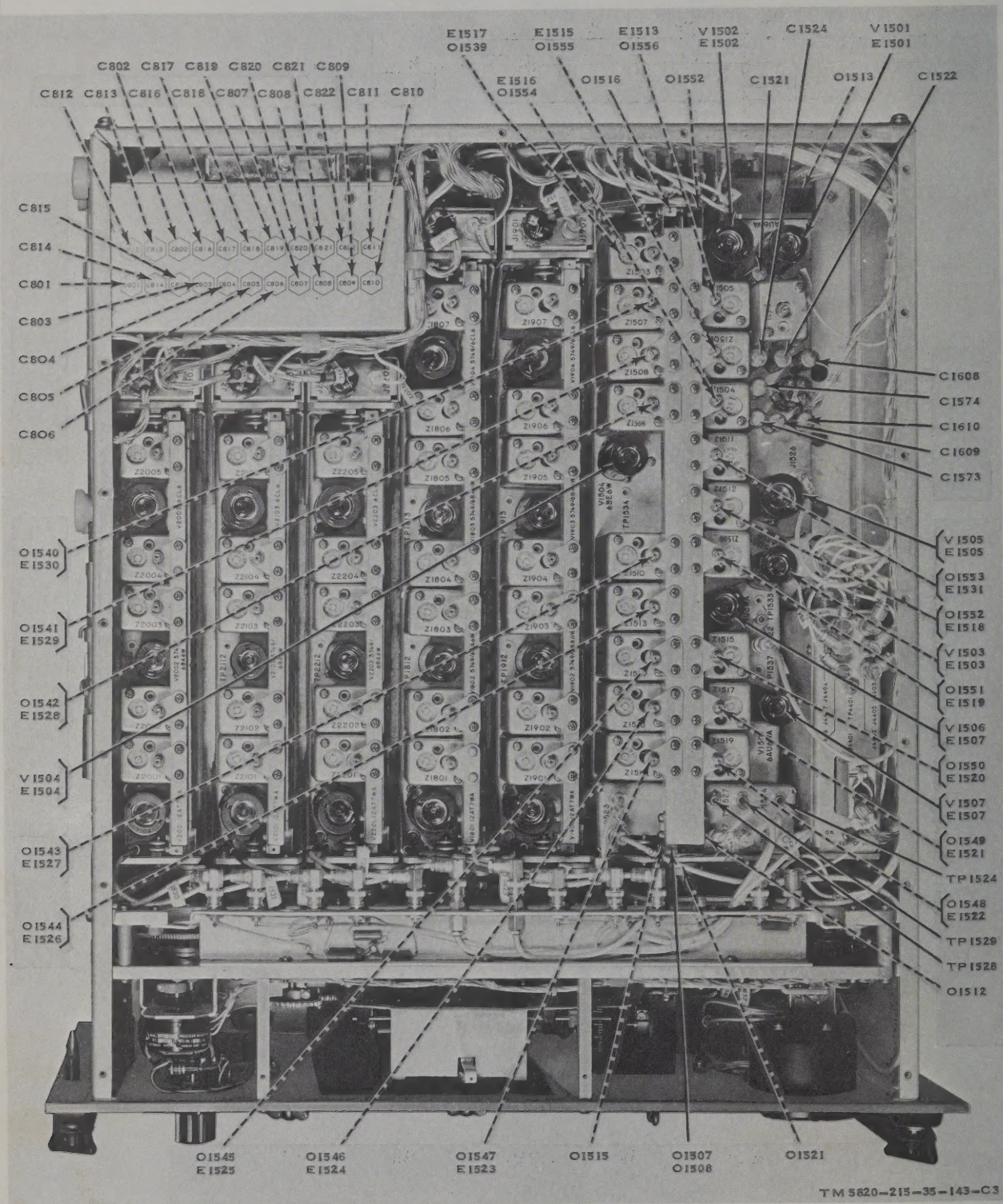


Figure 110. (Superseded) Exciter-monitor, top view.

✓ Page 135, figure 111. Make the following changes: Delete callout R1815 (next to L1811).

✓ Add a dashed arrow directly beneath R1816, and identify it "TP1814 (HIDDEN)."

✓ Add an arrow to the right of C1825 (bottom), and identify it "TP1809."

✓ Figure 112. Make the following changes: Delete callout TP1942 and substitute TP1908.

✓ Add a dashed arrow directly beneath resistor R1920 and identify it "C1932 (HIDDEN)."

✓ Add a dashed arrow directly beneath C1932, and identify it "TP1914 (HIDDEN)."

✓ Page 136, figure 114. Add a dashed arrow to the right of XV2102, and identify it "TP2112 (HIDDEN)."

✓ Page 140, figure 119. Make the following changes: Delete callout R1701 and substitute L1701.

✓ Add dashed arrow to the capacitor directly above R1705. Identify the arrow as "R1704 (hidden)."

✓ Page 145. Delete figures 123 and 124 and substitute new figures 123 and 124.

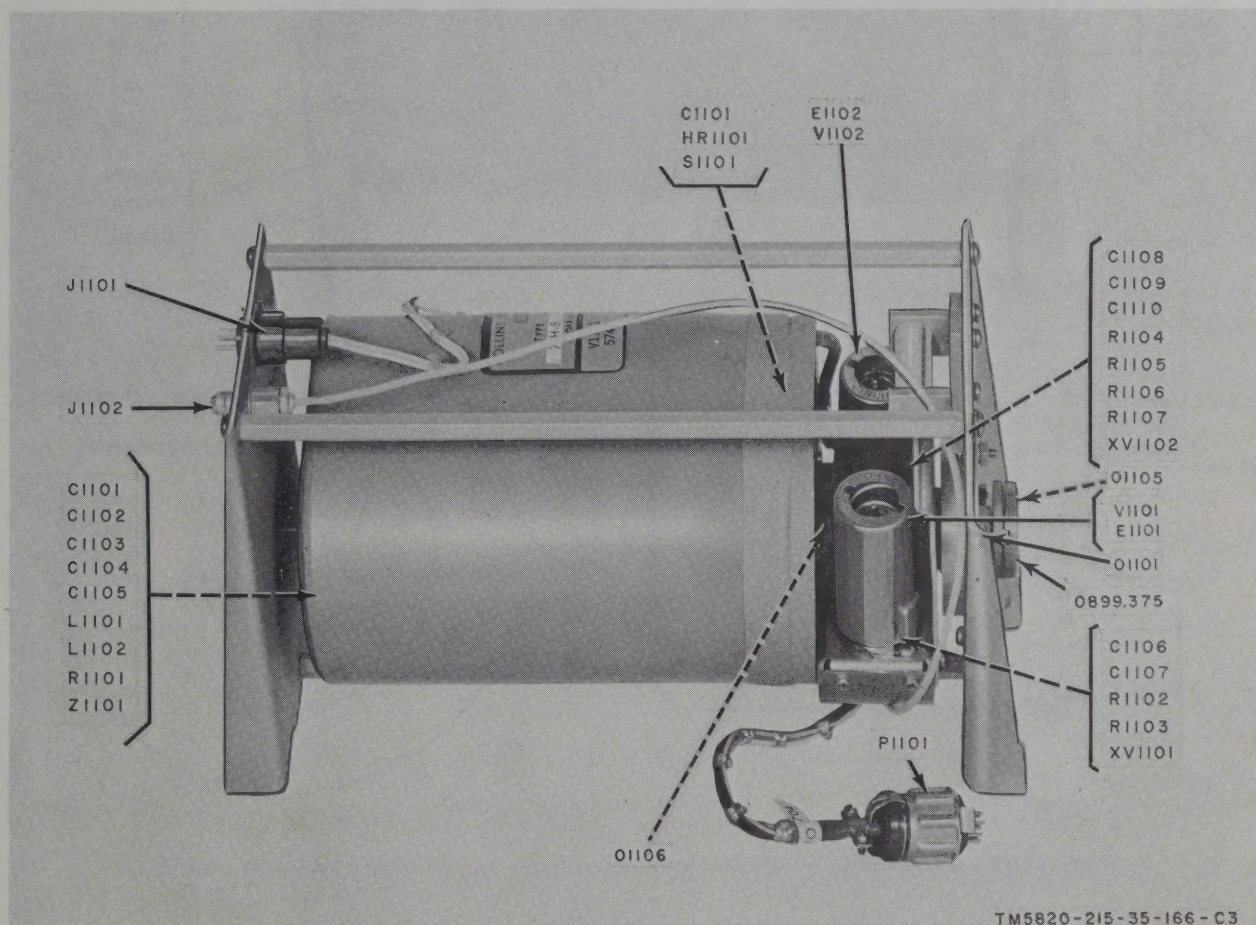


Figure 123. (Superseded) Exciter-monitor, smo subchassis, location of components.

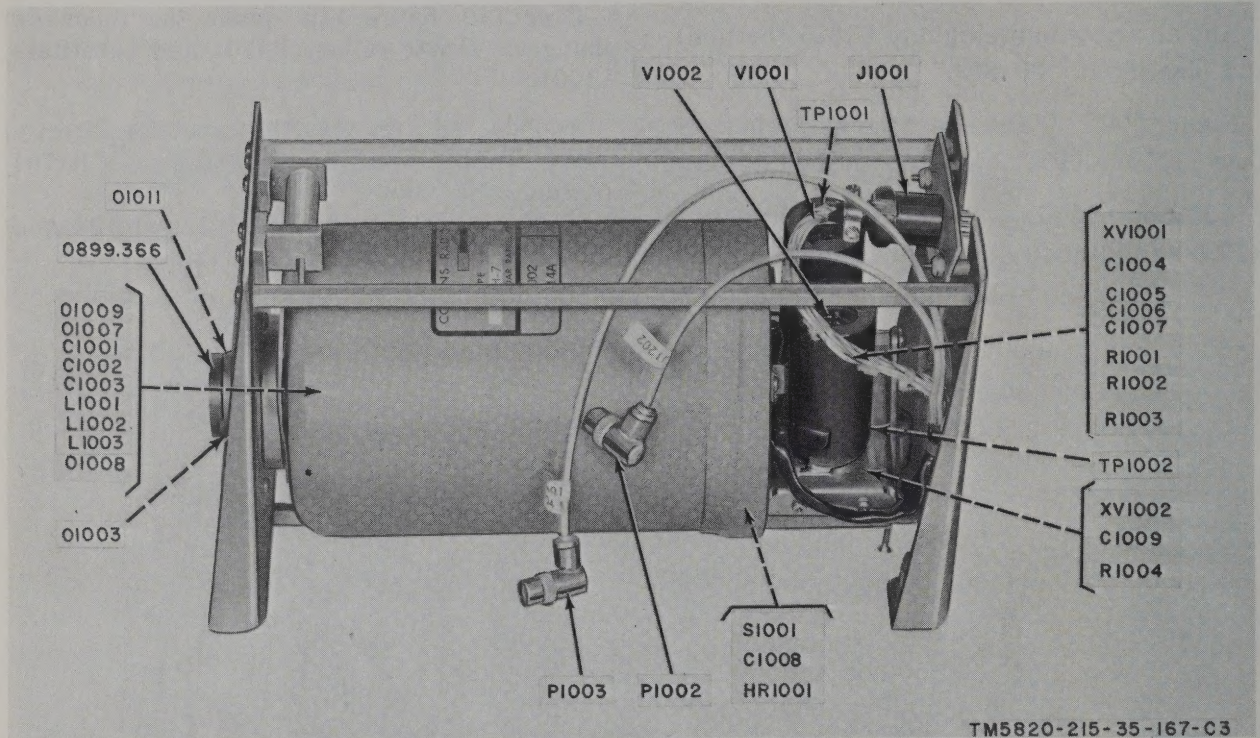


Figure 124. (Superseded) Exciter-monitor, interpolation oscillator subchassis, location of components.

Figure 124.1 (as added by C 1, 16 Oct 61).

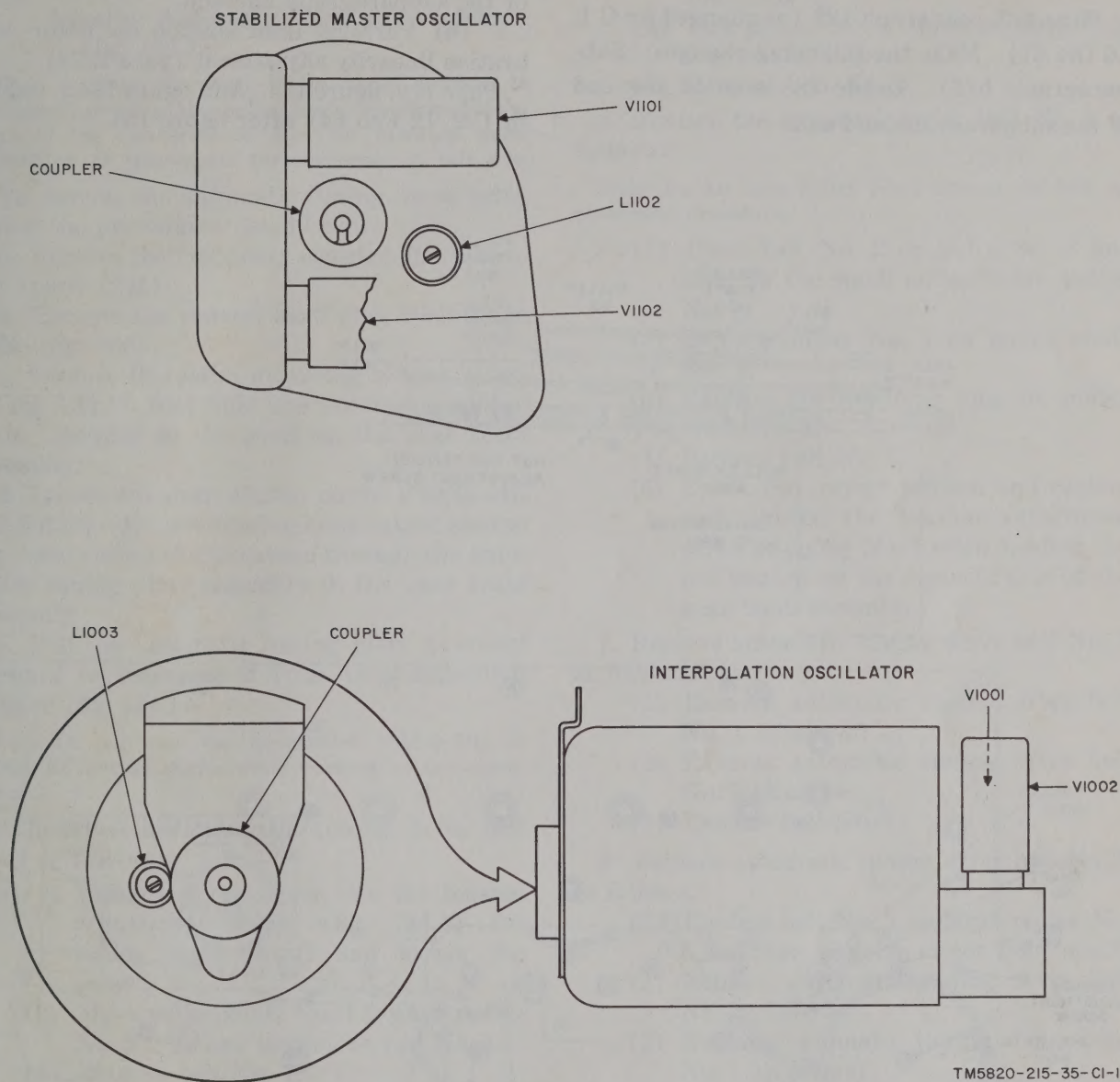


Figure 124.1 Interpolation and stabilized master oscillators, linearity adjustment points.

✓ Page 147, figure 125 (part 2 of 2). Draw an arrow from callout C1207 to the capacitor on the left of capacitor C1211.

Page 157, paragraph 123 (as changed by C 1, 16 Oct 61). Make the following changes: Subparagraph b(5). Delete the note at the end of the subparagraph and add:

✓ (6) Perform oscillator calibration linearity adjustment (para 127c).

✓ Subparagraph d(5). Delete note at the end of the subparagraph and add:

(6) Perform interpolation oscillator calibration linearity adjustment (para 127d).

✓ Page 170, figure 134. Add figure 134.1 (added by C 2, 12 Feb 64) after figure 134.

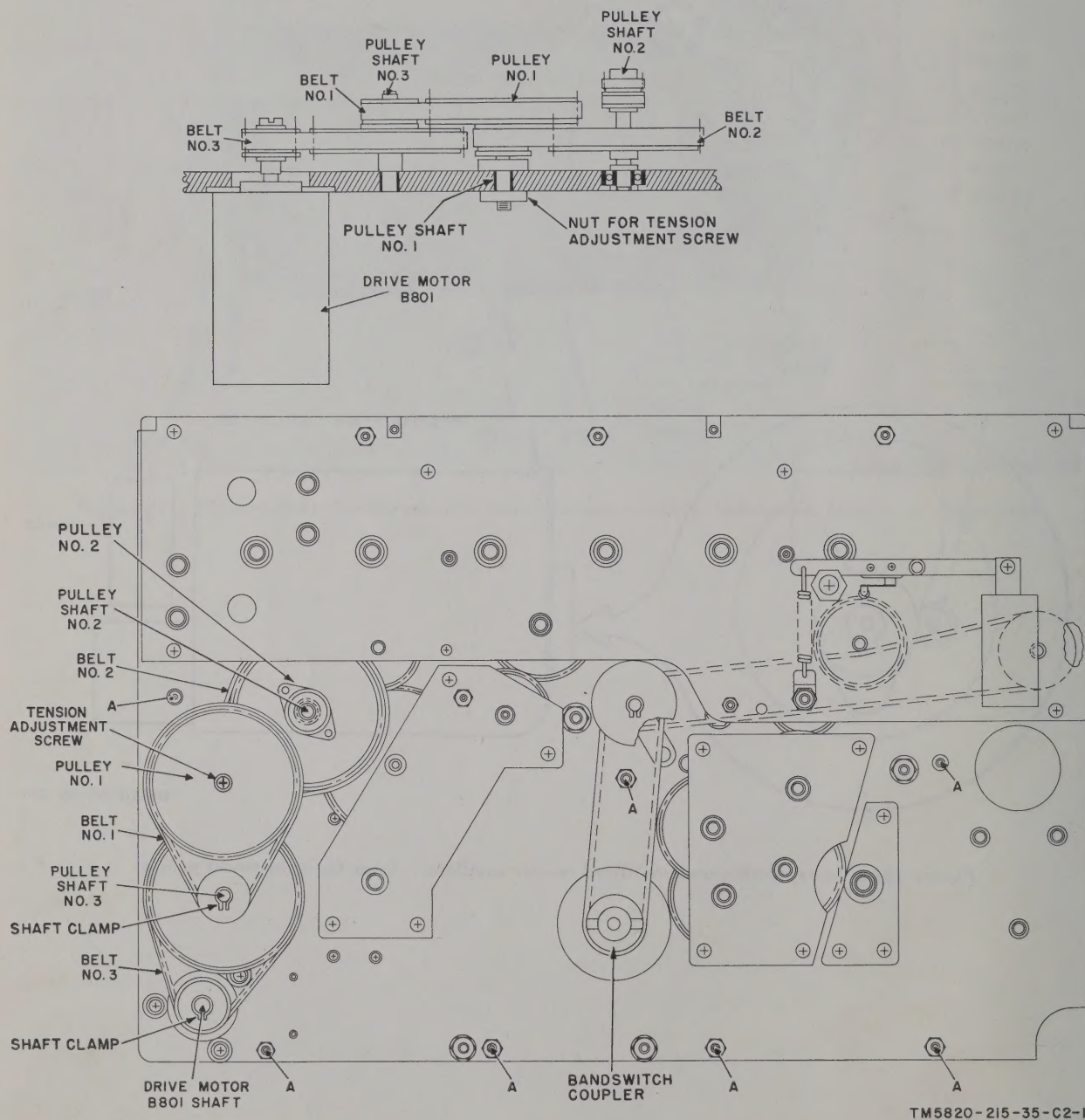


Figure 134.1 Exciter-monitor automatic tuning drive belts.

✓ Add paragraph 124.1 after paragraph 124 (added C 2, 12 Feb 64).

124.1 Removal and Replacement of Exciter-Monitor Automatic Tuning Drive Belts (fig. 134.1)

Note. On order No. 20413-PC-61, serial numbers 28 and above, an adjustable pulley mounting allows adjustment of the two drive belts in the autotune drive mechanism to compensate for variations in belt size.

To remove the automatic tuning drive belts, follow the procedures listed below:

a. Remove the frequency counter dial assembly (para 124k).

b. Remove the control head plug P805 from J805 (fig. 108).

c. Remove the seven mounting screws (item A, fig. 134.1) that hold the automatic tuning plate assembly to the posts on the gear train assembly.

d. Loosen the shaft clamps on the *FREQ-MC* and *FREQ-KC* positioning head output shafts. The head output shafts extend through the automatic tuning plate assembly to the gear train assembly.

e. Pull the automatic tuning plate assembly forward to disengage it from the bandswitch coupler (fig. 134.1).

Note. Do not turn the bandswitch *FREQ-MC* or *FREQ-KC* output shafts while working on the equipment.

f. Remove the automatic tuning drive belt No. 1 as follows:

- (1) Insert a screwdriver into the tension adjustment screw (fig. 134.1) for pulley shaft No. 1 and loosen the screw.
- (2) Move pulley shaft No. 1 toward pulley No. 3 to reduce tension on belt No. 1.
- (3) Remove belt No. 1.

g. Replace the automatic tuning drive belt No. 1 as follows:

- (1) Place belt No. 1 on pulley No. 3 and then on pulley No. 1.
- (2) Move pulley No. 1 to obtain the required tension on belts No. 1 and No. 2.
- (3) Tighten the tension adjustment screw.

h. Remove the automatic tuning drive belt No. 2 as follows:

- (1) Remove the automatic tuning drive belt No. 1 (*f* above).
- (2) Remove belt No. 2 from pulley No. 2.

Note. The belt will still be held by the small pulley mounted on shaft below No. 1.

(3) Remove the retaining ring on pulley shaft No. 1.

(4) Pull pulley No. 1 forward until it is free of shaft No. 1.

(5) Remove belt No. 2.

i. Replace the automatic drive belt No. 2 as follows:

Note. Do not turn pulley No. 2 during the belt replacement procedure.

(1) Place belt No. 2 on pulley No. 2 and then on the small pulley below pulley No. 1.

(2) Replace pulley No. 1 on pulley shaft No. 1.

(3) Replace the retaining ring on pulley shaft No. 1.

(4) Replace belt No. 1.

(5) Check for correct tension and replace and tighten the tension adjustment screw of pulley No. 1 while holding the nut located on the opposite side of the gear train assembly.

j. Remove automatic tuning drive belt No. 3 as follows:

(1) Remove automatic tuning drive belt No. 1 (*f* above).

(2) Remove automatic tuning drive belt No. 2 (*h* above).

(3) Remove belt No. 3.

k. Replace automatic tuning drive belt No. 3 as follows:

(1) Replace belt No. 3 on large pulley No. 3 and then on drive motor B801 shaft.

(2) Replace automatic tuning drive belt No. 2 (*i* above).

(3) Replace automatic tuning drive belt No. 1 (*g* above).

l. Replace the automatic tuning plate assembly. Make sure that the bandswitch coupler (fig. 134.1) is fully engaged.

m. Replace the seven mounting screws (item A, fig. 134.1) and secure the automatic tuning plate assembly on the posts on the gear train assembly.

n. Reconnect control head plug P805 to J805 (fig. 108).

o. Replace the frequency counter dial assembly (para 124l).

p. Replace the front panel (para 123o).

Add paragraph 124.2 and figures 134.2 through 134.6 after paragraph 124.1.

124.2 Disassembly and Assembly of Exciter-Monitor Mechanical Units

a. *Disassembly of Automatic Tuning Control Head* (fig. 134.2). After the automatic tuning control head has been removed (para 124e), disassemble it as follows:

- (1) Remove four 4-40 screws (4) which attach rear plate (1) to bottom casting (7) and top casting (26).
- (2) Remove retaining rings (2 and 3) from the rear end of switch shaft (34).
- (3) Remove rear plate (1) from the assembly.
- (4) Remove four 2-56 screws (6) and cover plate (5) from bottom casting (7) and top casting (26).
- (5) Remove four 2-56 screws (28) and cover plate (27) from bottom casting (7) and top casting (26).
- (6) Remove 4-40 screw (9) and lockwasher (10) from front plate (8).
- (7) Remove 4-40 screw (11), lockwasher (12), and cable clamp (13) from front plate (8).
- (8) Remove bottom casting (7), which contains snap switches (53 and 55) and switch mounting plate (52), from the assembly.
- (9) Remove four 2-56 screws (54 and 56) and snap switches (53 and 55) from switch mounting plate (52).
- (10) Remove two 4-40 screws (50), two lockwashers (51), and switch mounting plate (52) from bottom casting (7).
- (11) Remove two 5-40 screws (19) and wafer switch (24) from front plate (8) and switch shaft (34).
- (12) Remove two 5-40 screws (17), two lockwashers (18), and top casting (26) from front plate (8).
- (13) Remove switch shaft (34) and assembly from front plate (8).
- (14) Remove 4-40 screws (15 and 16), lockwashers (14 and 58), 4-40 nut (57), solder lug (59), and leaf

switches (60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72) from front plate (8).

- (15) Remove ratchet gear (29) and ratchet gear bearing sleeve (33) from switch shaft (34).
- (16) Remove ratchet pin (32), ratchet catch (31), and ratchet spring (30) from ratchet gear (29).
- (17) Loosen 6-40 setscrews (48 and 49) and remove ratchet (47) from switch shaft (34).
- (18) Remove retaining ring (46) and flat washers (44 and 45) from switch shaft (34).
- (19) Remove retaining ring (43), clutch washer (42), clutch springs (40 and 41), clutch washers (38 and 39), and stop lever (37) from clutch hub (36).
- (20) Remove clutch hub (36) and disk driver (35) from switch shaft (34).
- (21) Remove grommet (25) from front plate (8).

b. *Reassembly of Automatic Tuning Control Head* (fig. 134.2).

- (1) Lubricate the portion of switch shaft (34) under clutch hub (36) with MIL-G-15719 grease.
- (2) Lubricate the bearings in front plate (8) ratchet sleeve bearing (33), and ratchet catch (31) with MIL-G-3278 grease (Esso Beacon 325).
- (3) Lubricate the rotor of wafer switch (24) with a mixture consisting of 25 percent MIL-G-3278 grease and 75 percent trichloroethylene.
- (4) Assemble bottom casting (7) and switch mounting plate (52) with two 4-40 screws (50) and two lockwashers (51).
- (5) Position ratchet catch (31) and ratchet spring (30) in the recessed hub of ratchet gear (29). Secure with ratchet pin (32).
- (6) Install ratchet sleeve bearing (33) and ratchet gear (29) on switch shaft (34). Pass this assembly through rear plate (1) and seat ratchet sleeve bearing (33) in the hole.
- (7) Attach ratchet sleeve bearing (33) to plate (1) with retaining ring (3).

Secure switch shaft (34) to ratchet sleeve bearing (33) with retaining ring (2).

- (8) Install disk driver (35) on switch shaft (34).
- (9) Assemble clutch hub (36), stop lever (37), clutch washers (38 and 39), clutch springs (40 and 41), and clutch washer (42). Secure this assembly with retaining ring (43), and install on switch shaft (34).
- (10) Place washers (44 and 45) on switch shaft (34) and secure with retaining ring (46).

Note. Clutch stop lever (37) must transmit 1 to 2 inch-pounds torque. Use clutch washer (42) as shim to adjust the clutch. The number of clutch springs (40 or 41) may be varied to adjust torque. The flat washers (44 and 45) are shims to provide 0.003- to 0.010-inch clearance; vary their number as required to obtain this tolerance.

- (11) Install ratchet (47) on switch shaft (34) and secure with 6-40 setscrews (48 and 49).
- (12) Attach leaf switch (60 through 72) to front plate (8) with 4-40 screws (15 and 16), lockwashers (14 and 58), solder lug (59), and 4-40 nut (57).
- (13) Install snap switches (53 and 55) on switch mounting plate (52) with four 2-56 screws (56).
- (14) Fit front plate (8) on switch shaft (34). Attach bottom casting (7) to front plate (8) with 4-40 screw (9), lockwasher (10), 4-40 screw (11), lockwasher (12), and cable clamp (13).
- (15) Attach bottom casting (7) to rear plate (1) with two 4-40 screws (4).
- (16) Assemble grommet (25) to front plate (8).
- (17) Assemble top casting (26) to rear plate (1) with two 4-40 screws (4), and to front plate (8) with two 5-40 screws (17) and two lockwashers (18).
- (18) Assemble wafer switch (24) to front plate (8) with two 5-40 screws (19).
- (19) Assemble cover plate (5) to bottom casting (7) and top casting (26) with four 2-56 screws (6).

- (20) Assemble cover plate (27) to bottom casting (7) and top casting (26) with four 2-56 screws (28).

- (21) Replace the automatic tuning control head (para 124f).

c. Disassembly of Mechanical Interpolator Unit (fig. 134.3). After the mechanical interpolator unit has been removed (para 124g), disassemble it as follows:

- (1) Disconnect solenoid arm (9) by removing 4-40 screw (2) from the armature of solenoid (1).
- (2) Remove retaining pin (11), retaining ring (13), and solenoid arm (9) from pivot arm (10).
- (3) Disconnect and remove pawl springs (116, 118, 120, and 122) from pawls (117, 119, 121, and 123) and spring mounting bracket (80).
- (4) Disconnect detent spring (200) from spring retaining lug (18).
- (5) Remove two 6-32 screws (23) and two lockwashers (24) from end plate A (29).
- (7) Remove three 6-32 screws (27) and three lockwashers (28), that secure steel posts (83 and 153) and detent shaft (75) to end plate A (29).
- (8) Remove 4-40 screw (25) and lockwasher (26) from end plate A (29).
- (9) Remove 4-40 screw (3), lockwasher (4), and flat washer (5) from end plate A (29).
- (10) Remove 6-32 screw (6), lockwasher (7), flat washer (8), and solenoid (1) from end plate A (29).
- (11) Remove end plate A (29) from the remainder of the assembly.
- (12) Remove 6-32 screw (19) and spring retaining lug (18) from end plate A (29).
- (13) Remove detent spring (200), retaining ring (97), and roller detent arm (96) from end plate A (29).
- (14) Remove 6-32 screw (21), lockwasher (22), and sector stop post (30) from end plate A (29).
- (15) Remove ball bearings (108, 140, and 154) from end plate A (29).
- (16) Remove retaining ring (16), retaining pin (12), and cam lifter arm (17) from pivot arm (10).

- | | |
|--|--|
| 1 Plate, rear | 37 Lever, stop (clutch) |
| 2 Ring, retaining | 38 Washer, clutch |
| 3 Ring, retaining | 39 Washer, clutch |
| 4 Screw, machine, No. 4-40, $\frac{3}{16}$ in. long | 40 Spring, clutch |
| 5 Cover plate | 41 Spring, clutch |
| 6 Screw, machine, No. 2-56, $\frac{1}{8}$ in. long | 42 Washer, clutch |
| 7 Casting, bottom | 43 Ring, retaining |
| 8 Plate, front | 44 Washer, flat |
| 9 Screw, machine, No. 4-40, $\frac{3}{16}$ in. long | 45 Washer, flat |
| 10 Lockwasher | 46 Ring, retaining |
| 11 Screw, machine, No. 4-40, $\frac{5}{16}$ in. long | 47 Ratchet |
| 12 Lockwasher | 48 Setscrew, No. 6-40 |
| 13 Clamp, cable | 49 Setscrew, No. 6-40 |
| 14 Lockwasher | 50 Screw, machine, No. 4-40, $\frac{3}{16}$ in. long |
| 15 Screw, machine, No. 4-40, $\frac{3}{16}$ in. long | 51 Lockwasher |
| 16 Screw, machine, No. 4-40, $\frac{3}{16}$ in. long | 52 Plate, switch mounting |
| 17 Screw, machine, No. 5-40, $\frac{3}{16}$ in. long | 53 Switch, snap (S8003 or S8004) |
| 18 Lockwasher | 54 Screw, machine, No. 2-56, $\frac{5}{8}$ in. long |
| 19 Screw, machine, No. 5-40, $\frac{3}{16}$ in. long | 55 Switch, snap (S8003 or S8004) |
| 20 Not used. | 56 Screw, machine, No. 2-56, $\frac{5}{8}$ in. long |
| 21 Not used. | 57 Nut, machine, 4-40 |
| 22 Not used. | 58 Lockwasher |
| 23 Not used. | 59 Lug, solder |
| 24 Switch, wafer, S8001 | 60 Mount, leaf switch |
| 25 Grommet | 61 Spacer, leaf switch |
| 26 Casting, top | 62 Leaf (A), leaf switch |
| 27 Cover plate | 63 Spacer, leaf switch |
| 28 Screw, machine, No. 2-56, $\frac{1}{8}$ in. long | 64 Leaf (B), leaf switch |
| 29 Gear, ratchet | 65 Spacer, leaf switch |
| 30 Spring, ratchet | 56 Sleeve, insulator, leaf switch |
| 31 Catch, ratchet | 67 Sleeve, insulator, leaf switch |
| 32 Pin, ratchet | 68 Spacer, leaf switch |
| 33 Bearing, sleeve, ratchet | 69 Lockwasher |
| 34 Shaft, switch | 70 Lockwasher |
| 35 Driver, disk (clutch) | 71 Screw, machine, No. 4, $\frac{5}{16}$ in. long |
| 36 Hub, clutch | 72 Screw, machine, No. 4, $\frac{5}{16}$ in. long |

Figure 134.2 Automatic tuning control head, exploded view.

- | | |
|--|--|
| (17) Remove retaining ring (15), flat washer (14), retaining pin (81), and pivot arm (10) from spring mounting bracket (80). | (23) Remove cluster gear assembly A (114), shim washers (109, 110, and 111), and ball bearing (115) from end plate B (175). |
| (18) Remove 4-40 screw (183) and lockwasher (182) from end plate B (175) to release pawl shaft (125). Remove 6-32 screw (190) from end plate B (175) to release detent shaft (75). | (24) Loosen 4-40 screw (147) and remove gear clamp (148), spur gear segments (150 and 152), and spring (151) from auxiliary gear shaft (170). |
| (19) Remove the subassembly on pawl shaft (125) and the subassembly on detent shaft (75) from end plate B (175). | (25) Remove 6-32 screws (162, 164, and 202), lockwashers (163 and 165), and auxiliary gear plate (166) from steel posts (167 and 168 and auxiliary gear shaft 170). |
| (20) Remove gear cluster, subassembly C (156), ball bearing (161), and shim washers (159 and 160) from end plate B (175). | (26) Remove auxiliary gear shaft (170) and the attached parts from end plate B (175). |
| (21) Remove the cam subassembly on detent shaft (75) from end plate B (175). | (27) Remove cam shaft pinion (93) from cam shaft (85) by removing roll pin (94) and retaining ring (95). Remove cam subassembly (89) from end plate B (175), with cam lifter arm (17), cam shaft (85), cam lifter brackets (88 and 92), cam lifter (87), |
| (22) Remove gear cluster, assembly B (144), ball bearing (146), and shim washers (141 and 142) from end plate B (175). | |

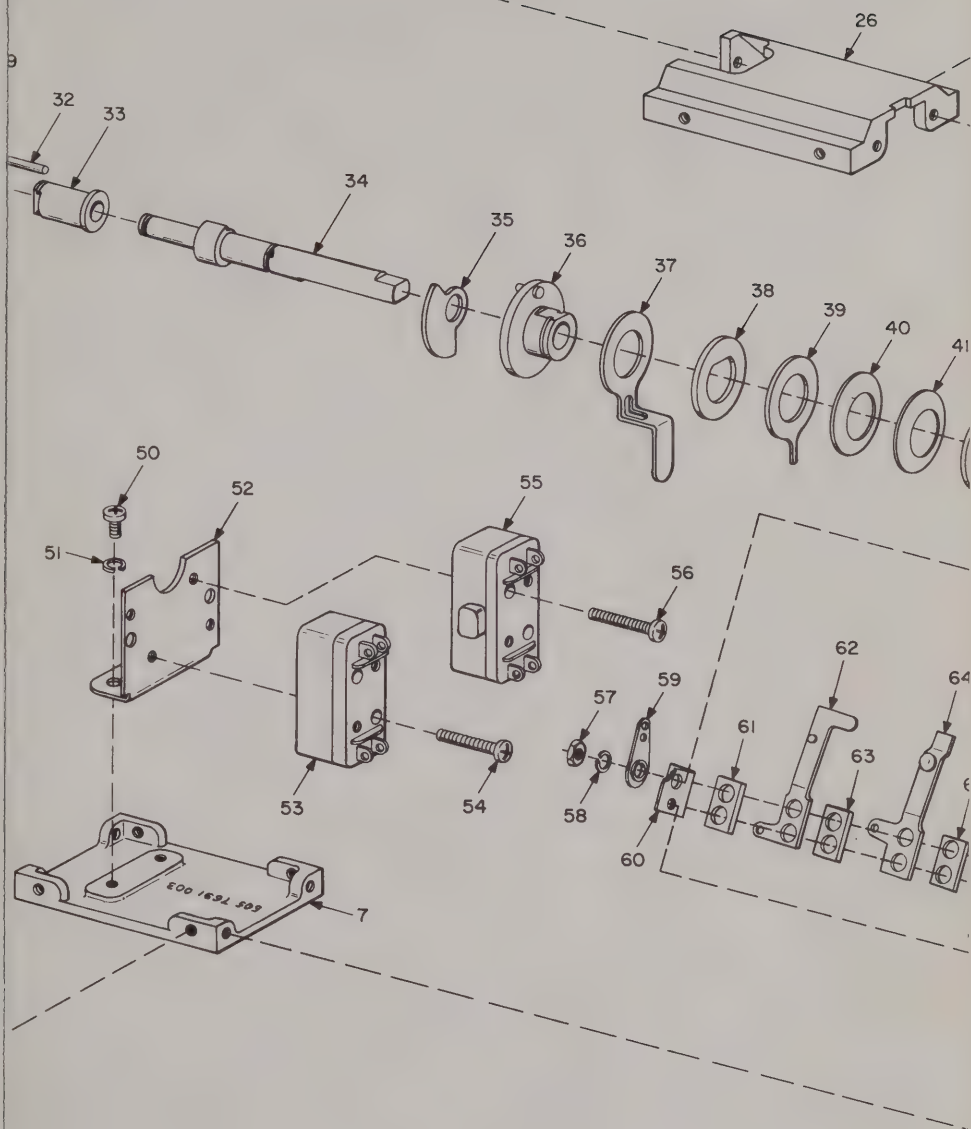
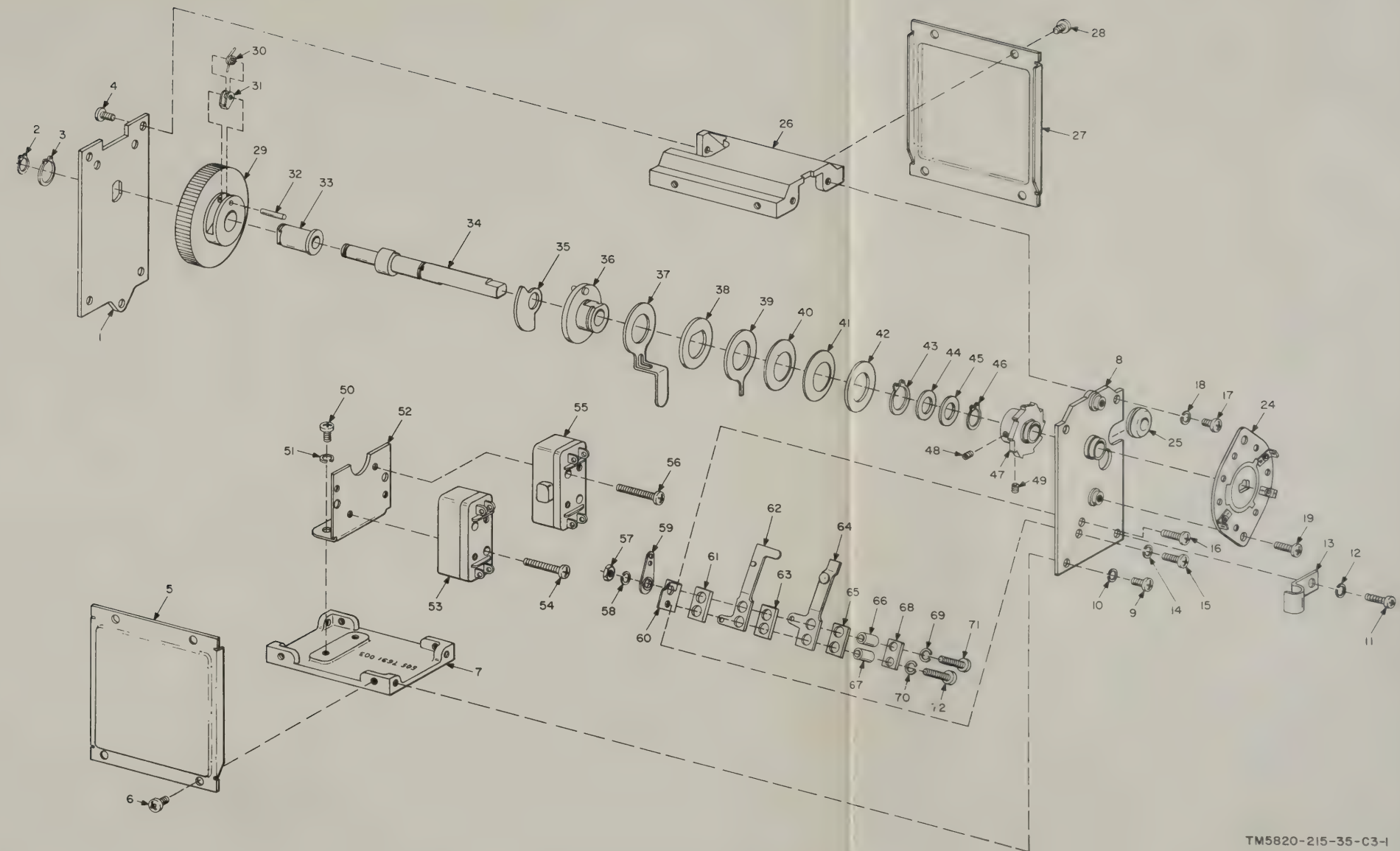


Figure 134.2 Automatic tuning control head, exploded view

- | | |
|--|--|
| 1 Plate, rear | 37 Lever, stop (clutch) |
| 2 Ring, retaining | 38 Washer, clutch |
| 3 Ring, retaining | 39 Washer, clutch |
| 4 Screw, machine, No. 4-40, $\frac{3}{16}$ in. long | 40 Spring, clutch |
| 5 Cover plate | 41 Spring, clutch |
| 6 Screw, machine, No. 2-56, $\frac{1}{8}$ in. long | 42 Washer, clutch |
| 7 Casting, bottom | 43 Ring, retaining |
| 8 Plate, front | 44 Washer, flat |
| 9 Screw, machine, No. 4-40, $\frac{3}{16}$ in. long | 45 Washer, flat |
| 10 Lockwasher | 46 Ring, retaining |
| 11 Screw, machine, No. 4-40, $\frac{5}{16}$ in. long | 47 Ratchet |
| 12 Lockwasher | 48 Setscrew, No. 6-40 |
| 13 Clamp, cable | 49 Setscrew, No. 6-40 |
| 14 Lockwasher | 50 Screw, machine, No. 4-40, $\frac{3}{16}$ in. long |
| 15 Screw, machine, No. 4-40, $\frac{3}{16}$ in. long | 51 Lockwasher |
| 16 Screw, machine, No. 4-40, $\frac{3}{16}$ in. long | 52 Plate, switch mounting |
| 17 Screw, machine, No. 5-40, $\frac{3}{16}$ in. long | 53 Switch, snap (S8003 or S8004) |
| 18 Lockwasher | 54 Screw, machine, No. 2-56, $\frac{5}{8}$ in. long |
| 19 Screw, machine, No. 5-40, $\frac{3}{16}$ in. long | 55 Switch, snap (S8003 or S8004) |
| 20 Not used. | 56 Screw, machine, No. 2-56, $\frac{5}{8}$ in. long |
| 21 Not used. | 57 Nut, machine, 4-40 |
| 22 Not used. | 58 Lockwasher |
| 23 Not used. | 59 Lug, solder |
| 24 Switch, wafer, S8001 | 60 Mount, leaf switch |
| 25 Grommet | 61 Spacer, leaf switch |
| 26 Casting, top | 62 Leaf (A), leaf switch |
| 27 Cover plate | 63 Spacer, leaf switch |
| 28 Screw, machine, No. 2-56, $\frac{1}{8}$ in. long | 64 Leaf (B), leaf switch |
| 29 Gear, ratchet | 65 Spacer, leaf switch |
| 30 Spring, ratchet | 66 Sleeve, insulator, leaf switch |
| 31 Catch, ratchet | 67 Sleeve, insulator, leaf switch |
| 32 Pin, ratchet | 68 Spacer, leaf switch |
| 33 Bearing, sleeve, ratchet | 69 Lockwasher |
| 34 Shaft, switch | 70 Lockwasher |
| 35 Driver, disk (clutch) | 71 Screw, machine, No. 4, $\frac{5}{16}$ in. long |
| 36 Hub, clutch | 72 Screw, machine, No. 4, $\frac{5}{16}$ in. long |

Figure 134.2 Automatic tuning control head, exploded view.

- | | |
|--|--|
| (17) Remove retaining ring (15), flat washer (14), retaining pin (81), and pivot arm (10) from spring mounting bracket (80). | (23) Remove cluster gear assembly A (114), shim washers (109, 110, and 111), and ball bearing (115) from end plate B (175). |
| (18) Remove 4-40 screw (183) and lockwasher (182) from end plate B (175) to release pawl shaft (125). Remove 6-32 screw (190) from end plate B (175) to release detent shaft (75). | (24) Loosen 4-40 screw (147) and remove gear clamp (148), spur gear segments (150 and 152), and spring (151) from auxiliary gear shaft (170). |
| (19) Remove the subassembly on pawl shaft (125) and the subassembly on detent shaft (75) from end plate B (175). | (25) Remove 6-32 screws (162, 164, and 202), lockwashers (163 and 165), and auxiliary gear plate (166) from steel posts (167 and 168 and auxiliary gear shaft 170). |
| (20) Remove gear cluster, subassembly C (156), ball bearing (161), and shim washers (159 and 160) from end plate B (175). | (26) Remove auxiliary gear shaft (170) and the attached parts from end plate B (175). |
| (21) Remove the cam subassembly on detent shaft (75) from end plate B (175). | (27) Remove cam shaft pinion (93) from cam shaft (85) by removing roll pin (94) and retaining ring (95). Remove cam subassembly (89) from end plate B (175), with cam lifter arm (17), cam shaft (85), cam lifter brackets (88 and 92), cam lifter (87), |
| (22) Remove gear cluster, assembly B (144), ball bearing (146), and shim washers (141 and 142) from end plate B (175). | |



TM5820-215-35-C3-1

Figure 134.2 Automatic tuning control head, exploded view—Continued.

- retaining ring (84), and bracket spacer (91) attached.
- (28) Remove switch actuator screw (86) from cam lifter (87).
 - (29) Remove retaining rings (124 and 139), shim washers (126, 127, 128, 130, 131, 133, 134, 136, 137, and 138), pawl spacers (129, 132, and 135), and pawls (117, 119, 121, and 123) from pawl shaft (125).
 - (30) Remove 4-40 screws (37, 41, 67, and 74) from sector gears (38, 42, 66, and 70). The pawl plate shafts (52 and 56) and their assemblies are not free.
 - (31) Remove pawl plate A (44), pawl plate C (53), 2-56 screw (50), and pawl plate spring (51) from pawl plate shaft (52).
 - (32) Remove pawl plate B (48), pawl plate D (61), 2-56 screw (55), and pawl plate spring (54) from pawl plate shaft (56).
 - (33) Remove retaining ring (31), shim washers (32, 33, 34, 35, and 36) and sector gear A (38) from detent shaft (75).
 - (34) Remove spacers 39, 40, 43, 45, and 46 and sector gear B (42) from detent shaft (75).
 - (35) Remove detent wheel A (47) and spacers (49, 57, 58, 59, and 60) from detent shaft (75).
 - (36) Remove detent wheel B (62) and spacers (63, 64, and 65) from detent shaft (75).
 - (37) Remove retaining ring (73), shim washers (71 and 72), and sector gear D (70) from detent shaft (75).
 - (38) Remove spacers (68 and 69) and gear sector C (66) from detent shaft (75).
 - (39) Loosen 4-40 screw (184) and remove gear clamp (185) and slotted coupler (187) from the shaft of pawl shaft detent (102).
 - (40) Loosen 4-40 screw (103) and remove gear clamp (104), pawl shaft pinion (106), and retaining ring (107) from the shaft of pawl shaft detent (102).
 - (41) Remove two 2-56 screws (191), two 2-56 nuts (79), switch (78), switch accessory actuator (77), and switch-plate (76) from end plate B (175).
 - (42) Remove 6-32 screw (199), lockwasher (198), and ground lug (197) from end plate B (175).
 - (43) Remove 6-32 screw (194) and sector stop post (196) from end plate B (175).
 - (44) Remove 6-32 screws (193 and 195), steel post (83), and spring mounting bracket (80) from end plate B (175).
 - (45) Remove 6-32 screws (177, 179, and 181), lockwashers (176, 178, and 180), and steel posts (153, 167, and 168) from end plate B (175).
 - (46) Remove steel post (82) and 6-32 screw (192) from end plate B (175).
 - (47) Remove retaining rings (155 and 158) and spring (157) from gear cluster, subassembly C (156).
 - (48) Remove retaining ring (169) from auxiliary gear shaft (170).
 - (49) Loosen 4-40 screw (171) and remove pinion gear (174) and gear clamp (172) from auxiliary gear shaft (170).
 - (50) Remove retaining rings (143 and 145) from gear cluster, subassembly B (144).
 - (51) Remove spring (112) and retaining ring (113) from cluster gear, assembly A (114).
- d. Assembly of Mechanical Interpolator Unit (fig. 134.3).*
- (1) Attach steel post (153) to end plate B (175) with 6-32 screw (181) and lockwasher (180).
 - (2) Attach steel post (167) to end plate B (175) with 6-32 screw (177) and lockwasher (176).
 - (3) Attach steel post (168) to end plate B (175) with 6-32 screw (179) and lockwasher (178).
 - (4) Attach sector stop post (196) to end plate B (175) with 6-32 screw (194).
 - (5) Attach steel post (82) to end plate B (175) with 6-32 screw (192).
 - (6) Attach steel post (83) and spring mounting bracket (80) to end plate B (175) with 6-32 screws (193 and 195).

- (7) Attach switchplate (76), switch accessory actuator (77), and switch (78) to end plate B (175), with 2-56 screws (191) and two 2-56 nuts (79).
- (8) Attach ground lug (197) to end plate B (175), with 6-32 screw (199) and lockwasher (198).
- (9) Assemble auxiliary gear shaft (170), gear clamp (172), and pinion gear (174). Tighten gear clamp (172) with 4-40 screw (171) and 4-40 nut (173). Place retaining ring (169) on auxiliary gear shaft (170). Position this assembly on end plate B (175).
- (10) Attach steel post (201) to auxiliary gear plate (166) with 6-32 screw (202).
- (11) Place auxiliary gear plate (166) in position over steel posts (167 and 168) and auxiliary gear shaft (170). Secure with two 6-32 screws (164), two lockwashers (165), two 6-32 screws (162), and two lockwashers (163).
- (12) Assembly pawl shaft detent (102), gear clamp (104), and pawl shaft pinion (106). Secure with 4-40 machine screw (103), 4-40 nut (105), and retaining ring (107). Place retaining ring (101) and shim washers (98, 99, and 100) on the shaft of pawl shaft detent (102). Place this assembly in position on end plate B (175).
- (13) Place gear clamp (185) and slotted coupler (187) with rubber gasket (188) on shaft of pawl shaft detent (102), and secure with 4-40 machine screw (184) and 4-40 nut (186).
- (14) Assemble spur gear segments (150 and 152) and spring (151). Place this assembly on auxiliary gear shaft (170), along with gear clamp (148), and secure with 4-40 machine screw (147) and 4-40 nut (149). See that spring (151) does not drag on face of auxiliary gear plate (166).
- (15) Insert ball bearing (146) into auxiliary gear plate (166).
- (16) Place retaining ring (143), shim washers (141 and 142), retaining ring (145), and ball bearing (140) on gear cluster, subassembly B (144). Place this assembly in position with the end of the shaft inserted in ball bearing (146).
- (17) Insert ball bearing (161) for gear cluster, assembly C (156) in end plate B (175).
- (18) Attach ball bearing (154), retaining ring (155), spring (157), retaining ring (158), and shim washers (159 and 160) to gear cluster, assembly C (156).
- (19) Place shaft end of gear cluster, subassembly C (156) into ball bearing (161).
- (20) Insert ball bearing (115) for cluster gear, assembly A (114) in end plate B (175).
- (21) Attach spring (112), retaining ring (113), shim washers (109, 110, and 111), and ball bearing (108) to cluster gear, assembly A (114).
- (22) Insert the shaft end of cluster assembly C (156) in ball bearing (161).
- (23) Place pawls (117, 119, 121, and 123), shim washers (126, 127, 128, 130, 131, 133, 134, 136, 137, and 138), and spacers (129, 132, and 135) on pawl shaft (125), and secure with retaining rings (124 and 139). Attach this assembly to end plate B (175) by securing pawl shaft (125) with 4-40 screw (183) and lockwasher (182).
- (24) Thread switch actuator screw (86) into cam lifter (87).
- (25) Attach cam shaft pinion (93) to cam shaft (85) with roll pin (94) and retaining ring (95).
- (26) Place the assembly consisting of cam shaft (85), retaining ring (84), switch actuator screw (86), cam lifter (87), cam lifter brackets (88 and 92), bracket spacer (91), roll pin (90), cam subassembly (89), and cam lifter arm (17) into position on end plate B (175), interleaving the cam segments of cam subassembly (89) with the four pawls (117, 119, 121, and 123).
- (27) Install retaining ring (73), shim washers (71 and 72), sector gear D (70), gear spacers (68 and 69), sector gear C (66), gear spacers (63, 64, and

- 65), detent wheel B (62), wheel spacers (49, 57, 58, 59, and 60), detent wheel A (47), wheel spacers (43, 45, and 46), sector gear B (42), gear spacers (39 and 40), sector gear A (38), shim washers (32, 33, 34, 35, and 36), and retaining ring (31) on detent shaft (75).
- (28) Attach pawl plate spring (54) to pawl plate shaft (56) with 2-56 screw (55).
 - (29) Attach pawl plate spring (51) to pawl plate shaft (52) with 2-56 screw (50).
 - (30) Assemble pawl plate B (48), pawl plate D (61), and pawl plate shaft (56), hooking the ends of pawl plate spring (51) into the pawl plates. Place this assembly between sector gear B (42) and sector gear C (66), orienting it so that 2-56 screw (55) is nearest sector gear C (66). Attach this assembly with 4-40 screws (41 and 67) to sector gear B (42) and sector gear C (66).
 - (31) Assemble pawl plate A (44), pawl plate C (53), and pawl plate shaft (52), hooking the end of pawl plate spring (51) into the pawl plates. Place this assembly between sector gear A (38) and sector gear D (70), orienting it so that 2-56 screw (50) is nearest sector gear A (38). Attach this assembly with 4-40 screws (37 and 74) to sector gear A (38) and sector gear D (70).
 - (32) Place detent shaft (75) and the attached assembly in position on end plate B (175) with all sector gears rotated out of mesh with the remaining gears; they will be meshed after assembly. Attach detent shaft (75) to end plate B (175) with 6-32 screw (190).
 - (33) Attach roller detent arm (96) to end plate A (29) with retaining ring (97).
 - (34) Attach detent spring (200) to roller detent arm (96).
 - (35) Attach sector stop post (30) to end plate A (29) with 6-32 screw (21) and lockwasher (22).
- Note.* End play of shafts to be limited between 0.002 and 0.012 inch by adding or discarding shims.
- (36) Attach spring retaining lug (18) to end plate A (29) with 6-32 screw (19).
 - (37) Fit end plate A (29) over the assembly. Be certain that cam lifter arm (17), roller detent arm (96), and detent spring (200) are not entangled in the assembly.
 - (38) Temporarily attach end plate A (29) to steel posts (83 and 153) and detent shaft (75), with three 6-32 screws (27) and three lockwashers (28). Make certain that all items are seated correctly on end plate A (29); do not fasten the three 6-32 screws (27) securely at this time.
 - (39) Attach pawl shaft (125) to end plate A (29) with 4-40 screw (25) and lockwasher (26). Do not tighten.
 - (40) See that each shaft turns freely, that end plate A (29) is seated on all posts, and that roller detent arm (96), and detent spring (200) are not trapped in the assembly.
 - (41) Attach spring mounting bracket (80) to end plate A (29) with 6-32 screw (20), but do not tighten the screw.
 - (42) Attach end plate A (29) to post (83) with two 6-32 screws (23) and two lockwashers (24), but do not tighten the screws.
 - (43) Install solenoid (1) on end plate A (29) with 4-40 screw (3), lockwasher (4), and flat washer (5), securing to steel post (82). Do not tighten the screw.
 - (44) Attach solenoid (1) at the bottom on end plate A (29) with 6-32 screw (6), lockwasher (7), and flat washer (8). Do not tighten the screw.
 - (45) Connect solenoid arm (9) to the armature of solenoid (1) with 4-40 screw (2).
 - (46) Attach pivot arm (10) to spring mounting bracket (80), with retaining pin (81), flat washer (14), and retaining ring (15).
 - (47) Connect pivot arm (10) and solenoid arm (9), with retaining pin (11) and retaining ring (13).

- (48) Connect the remaining end of pivot arm (10) to cam lifter arm (17), with retaining pin (12) and retaining ring (16).
- (49) Hook the free end of detent spring (200) to spring retaining lug (18).
- (50) Hook either end of the four pawl springs (116, 118, 120, and 122) to pawls (117, 119, 121, and 123). Check to see that all four pawls fit properly against the segments of cam subassembly (89), and then hook the other end of the four pawl springs to spring mounting bracket (80).
- (51) Tighten all screws, securing the assembly while testing for free operation of all moving parts. Test for proper operation of cam lifter linkage, and then secure solenoid (1) to end plate A (29).
- (52) Rotate the detent assembly on detent shaft (75) so that all four sector gears (38, 42, 66, and 70) begin mesh with gear cluster, assembly A (114) and gear cluster, assembly C (156).
- (53) Rotate spur gear segments (150 and 152) while hand-starting the sector gears into mesh.
- (54) As the sector gears proceed into the assembly, guide the pawl plates (44, 48, 53, and 61) so that they interleave properly and straddle pawls (117, 119, 121, and 123).
- (55) Continue to rotate the detent assembly while checking for binding. The assembly should rotate freely until sector gears A and D (38 and 70) come to rest against sector stop posts (30 and 196).
- (56) Replace the mechanical interpolator unit (para 124 h).

e. Disassembly of Frequency Counter Dial Assembly (fig. 134.4). After the frequency counter dial assembly has been removed (para 124k), disassemble it as follows:

- (1) Remove retaining rings (6 and 7) from spool gear shaft (62).
- (2) Remove spool gear shaft (62) from counter frame (19), along with short spool gear (1), long spool gears (3 and 5), shim washers (2 and 4), and any additional shim washers.

Note. The number and thickness of shim washers may vary. To be certain that the shims are properly replaced, tag each shim and make note of the shim location on the tag.

- (3) Remove retaining rings (17) from pinion shaft (16).
- (4) Remove pinion shaft (16) from counter frame (19), along with pinions (11 through 14).
- (5) Remove 4-40 nut (8), 4-40 screw (15), spring (10), and spring clip (9) from counter frame (19).
- (6) Remove retaining ring (30) and spur gear (29) from counter frame (19).
- (7) Loosen 4-40 screw (34) on gear clamp (35). Remove level gear (33) and gear clamp (35) from drive shaft (51).
- (8) Remove retaining ring (32) and cluster gear (31) from counter frame (19).
- (9) Loosen 4-40 screw (45) on gear clamp (44), and loosen 4-40 screw (46) on gear clamp (47).
- (10) Remove retaining rings (37 and 50) from drive shaft (51).
- (11) Remove drive shaft (51) from counter frame (19), along with spur gear (38), cluster gears (40, 42, and 49), drive shaft posts (39 and 41), gear clamps (44 and 47), flat washer (43), and any additional flat washers. Refer to the note following (2) above.
- (12) Remove retaining rings (54 and 59) from idler shaft (55).
- (13) Remove idler shaft (55) from idler shaft carrier (58), along with idler pinions (69, 73, 77, and 81), idler shaft posts (67, 71, 75, and 79), shim washers (66, 68, 70, 72, 74, 76, 78, 80, 82, and 83) and any additional shim washers. Refer to the note following (2) above.
- (14) Loosen 4-40 screw (21) on gear clamp (22). Remove level gear (23) and gear clamp (22) from drive shaft (24).
- (15) Remove two 2-56 screws (27), two lockwashers (26), and dial mask (28) from counter frame (19).
- (16) Remove roll pin (53) from sector gear

- 1 Solenoid (K803)
- 2 Screw, machine, No. 4-40, $\frac{1}{2}$ in. long
- 3 Screw, machine, No. 4-40, $\frac{1}{2}$ in. long
- 4 Lockwasher
- 5 Washer, flat
- 6 Screw, machine, No. 6-32, $\frac{1}{4}$ in. long
- 7 Lockwasher
- 8 Washer, flat
- 9 Arm, solenoid (K803)
- 10 Arm, pivot
- 11 Pin, retaining, $\frac{3}{32}$ in. long
- 12 Pin, retaining, $\frac{3}{32}$ in. long
- 13 Ring, retaining
- 14 Washer, flat
- 15 Ring, retaining
- 16 Ring, retaining
- 17 Arm, cam lifter
- 18 Lug, spring retaining
- 19 Screw, machine, No. 6-32, $\frac{3}{8}$ in. long
- 20 Screw, machine, No. 6-32, $\frac{3}{8}$ in. long
- 21 Screw, machine, No. 6-32, $\frac{3}{8}$ in. long
- 22 Lockwasher
- 23 Screw, machine, No. 6-32, $\frac{3}{8}$ in. long
- 24 Lockwasher
- 25 Screw, machine, No. 4-40, $\frac{3}{8}$ in. long
- 26 Lockwasher
- 27 Screw, machine, No. 6-32, $\frac{3}{8}$ in. long
- 28 Lockwasher
- 29 Plate, end (A) (includes bearing 0899.27 and 0899.28)
- 30 Post, sector stop, $\frac{7}{16}$ in. long
- 31 Ring, retaining
- 32 Washer, shim
- 33 Washer, shim
- 34 Washer, shim
- 35 Washer, shim
- 36 Washer, shim
- 37 Screw, machine, No. 4-40, $\frac{3}{16}$ in. long
- 38 Gear, sector (A), 224 teeth (0870) (includes bearing 0892)
- 39 Spacer, gear
- 40 Spacer, gear
- 41 Screw, machine, No. 4-40, $\frac{1}{4}$ in. long
- 42 Gear, sector (B), 224 teeth (0872) (includes bearing 0893)
- 43 Spacer, wheel
- 44 Plate, pawl (A)
- 45 Spacer, wheel
- 46 Spacer, wheel
- 47 Wheel, detent (A) (0876) (includes 0894 and 0895)
- 48 Plate, pawl (B)
- 49 Spacer, wheel
- 50 Screw, machine, No. 2-56, $\frac{3}{16}$ in. long
- 51 Spring, pawl plate (0875)
- 52 Shaft, pawl plate
- 53 Plate, pawl (C)
- 54 Spring, pawl plate (0874)
- 55 Screw, machine, No. 2-56, $\frac{3}{16}$ in. long
- 56 Shaft, pawl plate
- 57 Spacer, wheel
- 58 Spacer, wheel
- 59 Spacer, wheel
- 60 Spacer, wheel
- 61 Plate, pawl (D)
- 62 Wheel, detent (B) (0881) (includes 0896 and 0897)
- 63 Spacer, gear
- 64 Spacer, gear
- 65 Spacer, gear
- 66 Gear, sector (C), 224 teeth (0873) (includes 0898)
- 67 Screw, machine, No. 4-40, $\frac{1}{4}$ in. long
- 68 Spacer, gear
- 69 Spacer, gear
- 70 Gear, sector (D), 224 teeth (0871) (includes 0899)
- 71 Washer, shim
- 72 Washer, shim
- 73 Ring, retaining
- 74 Screw, machine, No. 4-40, $\frac{1}{4}$ in. long
- 75 Shaft, detent
- 76 Switchplate, NPG plastic
- 77 Actuator, switch accessory (0899.394)
- 78 Switch (S807)
- 79 Nut, 2-56
- 80 Bracket, spring mounting, formed
- 81 Pin, retaining, $\frac{3}{8}$ in. long
- 82 Post, steel, 2 in. long
- 83 Post, steel 2 in. long
- 84 Ring, retaining
- 85 Shaft, cam
- 86 Screw, switch actuator, machine, No. 4-40, $\frac{3}{4}$ in. long
- 87 Lifter, cam
- 88 Lifter, cam
- 89 Cam, subassembly
- 90 Pin, formed roll
- 91 Spacer, bracket
- 92 Bracket, cam lifter
- 93 Pinion, cam shaft (0899.17)
- 94 Pin, formed roll
- 95 Ring, retaining
- 96 Arm, roller detent
- 97 Ring, retaining
- 98 Washer, shim
- 99 Washer, shim
- 100 Washer, shim
- 101 Ring, retaining
- 102 Detent, pawl shaft, 3 in. long (0899.398)
- 103 Screw, machine, No. 4-40, $\frac{1}{2}$ in. long
- 104 Clamp, gear
- 105 Nut, 4-40
- 106 Pinion, pawl shaft, 36 teeth (0859)
- 107 Ring, retaining
- 108 Bearing, sealed ball (0849)
- 109 Washer, shim
- 110 Washer, shim
- 111 Washer, shim
- 112 Spring, scissor gear tension (0899.395)
- 113 Ring, retaining (0899.395)
- 114 Cluster gear, assembly A, 60-teeth spur, 14-teeth pinion (0899.395) (includes 0899.6, 0899.5, and 0899.4)
- 115 Bearing, sealed ball (0850)
- 116 Spring, pawl (0899.33)
- 117 Pawl
- 118 Spring, pawl (0899.34)
- 119 Pawl
- 120 Spring, pawl (0899.35)
- 121 Pawl
- 122 Spring, pawl (0899.36)
- 123 Pawl
- 124 Ring, retaining
- 125 Shaft, pawl, approximately $2\frac{1}{16}$ in. long
- 126 Washer, shim
- 127 Washer, shim
- 128 Washer, shim
- 129 Spacer, pawl
- 130 Shim, metal washer
- 131 Washer, shim
- 132 Spacer, pawl
- 133 Washer, shim
- 134 Washer, shim
- 135 Spacer, pawl
- 136 Washer, shim
- 137 Washer, shim
- 138 Washer, shim
- 139 Ring, retaining
- 140 Bearing, sealed ball (0847)

Figure 134.3 Mechanical interpolator unit, exploded view.

141 Washer, shim
 142 Washer, shim
 143 Ring, retaining
 144 Gear cluster, subassembly B, pinned, 30 teeth (0899.8)
 145 Ring, retaining
 146 Bearing, sealed ball (0848)
 147 Screw, machine, No. 4-40, $\frac{1}{2}$ in. long
 148 Clamp, gear
 149 Nut, 4-40
 150 Gear, spur, 64 teeth (0899.1)
 151 Spring, scissor gear tension (0899.3)
 152 Gear, spur, 64 teeth (0899.2)
 153 Post, steel, 2 in. long
 154 Bearing, sealed ball (0851)
 155 Ring, retaining
 156 Gear cluster, subassembly C, 56 teeth (0899.397) (includes 0899.13, 0899.11, and 0899.10)
 157 Spring, scissor gear tension (0899.397)
 158 Ring, retaining (0899.397)
 159 Washer, shim
 160 Washer, shim
 161 Bearing, sealed ball (0852)
 162 Screw, machine, No. 6-32, $\frac{1}{4}$ in. long
 163 Lockwasher
 164 Screw, machine, No. 6-32, $\frac{1}{4}$ in. long
 165 Lockwasher
 166 Plate, auxiliary gear (includes 0899.32)
 167 Post, steel, $\frac{23}{32}$ in. long
 168 Post, steel, $\frac{5}{8}$ in. long
 169 Ring, retaining
 170 Shaft, gear, auxiliary $1\frac{17}{64}$ in. long

171 Screw, machine, No. 4-40, long
 172 Clamp, gear
 173 Nut, 4-40
 174 Gear, pinion, 24 teeth (0858)
 175 End plate B (includes 0899.29, 0899.30, and 0899.31)
 176 Lockwasher
 177 Screw, machine, No. 6-32, $\frac{3}{8}$ in. long
 178 Lockwasher
 179 Screw, machine, No. 6-32, $\frac{3}{8}$ in. long
 180 Lockwasher
 181 Screw, machine, No. 6-32, $\frac{3}{8}$ in. long
 182 Lockwasher
 183 Screw, machine, No. 4-40, $\frac{3}{8}$ in. long
 184 Screw, machine, No. 4-40, $\frac{1}{2}$ in. long
 185 Clamp, gear
 186 Nut, 4-40
 187 Slotted coupler (0899.400)
 188 Gasket, rubber
 189 Not used
 190 Screw, machine, No. 6-32, $\frac{3}{8}$ in. long
 191 Screw, machine, No. 2-56, $\frac{5}{8}$ in. long
 192 Screw, machine, No. 6-32, $\frac{3}{8}$ in. long
 193 Screw machine, No. 6-32, $\frac{3}{8}$ in. long
 194 Screw, machine, No. 6-32, $\frac{3}{8}$ in. long
 195 Screw, machine, No. 6-32, $\frac{1}{4}$ in. long
 196 Post sector stop, $\frac{7}{16}$ in. long
 197 Lug, ground
 198 Lockwasher
 199 Screw, machine, No. 6-32, $\frac{1}{8}$ in. long
 200 Spring, detent, $1\frac{5}{8}$ in. free length (0867)
 201 Post, steel, $\frac{23}{32}$ in. long
 202 Screw, machine, No. 6-32, $\frac{3}{8}$ in. long

Figure 134.3 Mechanical interpolator unit, exploded view—Continued.

(52). Remove sector gear (52) and sector arm assembly (20) from counter frame (19). Refer to the note following (2) above if there are shim washers on sector arm (20).

(17) Remove the roll pin (not shown) that attaches counter wheel (65) to drive shaft (24).

(18) Remove drive shaft (24) from counter frame (19), along with counter wheels (63 and 65), shim washer (64), and any additional shim washers. Refer to the note following (2) above.

(19) Remove retaining rings (60 and 61) from counter wheel shaft (18).

(20) Remove counter wheel shaft (18) from counter frame (19), along with counter wheels (92, 94, 96, 98, 100, 85, and 87), idler shaft carrier (58), shim washers (90, 91, 93, 95, 97, 99, 84, 86, 88, 89, 56, and 57), and any additional shims. Refer to the note following (2) above.

f. Assembly of Frequency Counter Dial Assembly (fig. 134.4).

(1) Insert counter wheel shaft (18) into counter frame (19) and idler shaft carrier (58), along with counter wheels (92, 94, 96, 98, 100, 85 and 87), shim washers (56, 57, 90, 91, 93, 97, 99, 84, 86, 88, and 89), and any additional shims.

(2) All counter wheels are to be positioned so that the initial reading is: (17 2.3) on counter wheel (92), (4) on counter wheel (94), (3) on counter wheel (96), (8) on counter wheel (98), (3) on counter wheel (100), (16) on counter wheel (85), and (3) on counter wheel (87).

(3) Attach retaining rings (60 and 61) to counter wheel shaft (18).

(4) Insert drive shaft (24) into counter frame (19), along with counter wheel (63 and 65), shim washer (64), and any additional shim washers. The initial reading on counter wheel (63) must be (0), and the initial reading on counter wheel (65) must be (00).

(5) Insert the roll pin (not shown) that attaches counter wheel (65) to drive

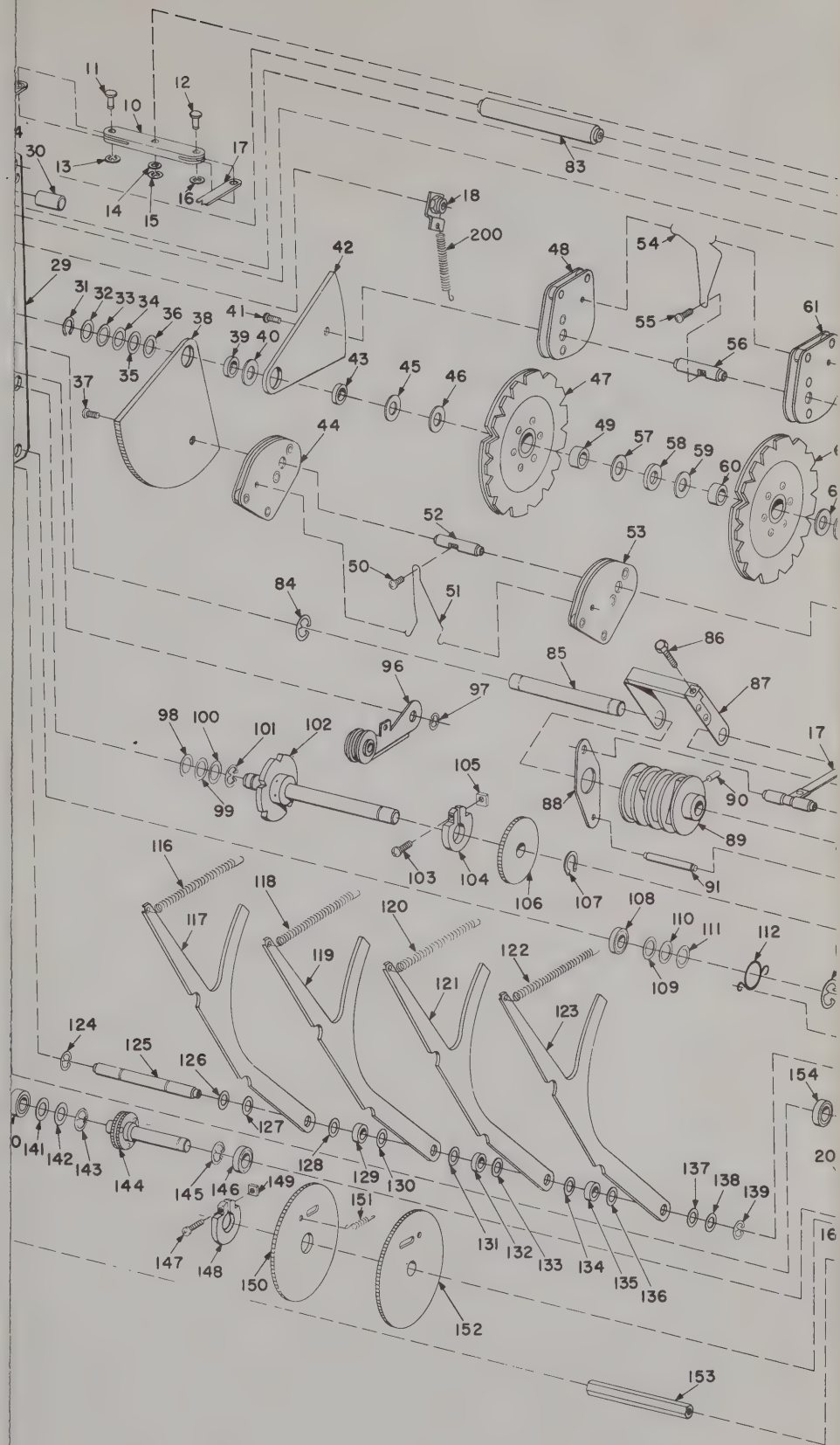


Figure 134.3 Mechanical interpolator unit, exploded

141 Washer, shim	171 Screw, machine, No. 4-40, long
142 Washer, shim	172 Clamp, gear
143 Ring, retaining	173 Nut, 4-40
144 Gear cluster, subassembly B, pinned, 30 teeth (0899.8)	174 Gear, pinion, 24 teeth (0858)
145 Ring, retaining	175 End plate B (includes 0899.29, 0899.30, and 0899.31)
146 Bearing, sealed ball (0848)	176 Lockwasher
147 Screw, machine, No. 4-40, ½ in. long	177 Screw, machine, No. 6-32, ⅜ in. long
148 Clamp, gear	178 Lockwasher
149 Nut, 4-40	179 Screw, machine, No. 6-32, ⅜ in. long
150 Gear, spur, 64 teeth (0899.1)	180 Lockwasher
151 Spring, scissor gear tension (0899.3)	181 Screw, machine, No. 6-32, ⅜ in. long
152 Gear, spur, 64 teeth (0899.2)	182 Lockwasher
153 Post, steel, 2 in. long	183 Screw, machine, No. 4-40, ⅜ in. long
154 Bearing, sealed ball (0851)	184 Screw, machine, No. 4-40, ½ in. long
155 Ring, retaining	185 Clamp, gear
156 Gear cluster, subassembly C, 56 teeth (0899.397) (includes 0899.13, 0899.11, and 0899.10)	186 Nut, 4-40
157 Spring, scissor gear tension (0899.397)	187 Slotted coupler (0899.400)
158 Ring, retaining (0899.397)	188 Gasket, rubber
159 Washer, shim	189 Not used
160 Washer, shim	190 Screw, machine, No. 6-32, ⅜ in. long
161 Bearing, sealed ball (0852)	191 Screw, machine, No. 2-56, ⅝ in. long
162 Screw, machine, No. 6-32, ¼ in. long	192 Screw, machine, No. 6-32, ⅜ in. long
163 Lockwasher	193 Screw machine, No. 6-32, ⅜ in. long
164 Screw, machine, No. 6-32, ¼ in. long	194 Screw, machine, No. 6-32, ⅜ in. long
165 Lockwasher	195 Screw, machine, No. 6-32, ¼ in. long
166 Plate, auxiliary gear (includes 0899.32)	196 Post sector stop, ⅞ in. long
167 Post, steel, 2⅜ in. long	197 Lug, ground
168 Post, steel, ⅝ in. long	198 Lockwasher
169 Ring, retaining	199 Screw, machine, No. 6-32, ⅜ in. long
170 Shaft, gear, auxiliary 1⅞ in. long	200 Spring, detent, 1⅝ in. free length (0867)
	201 Post, steel, 2⅜ in. long
	202 Screw, machine, No. 6-32, ⅜ in. long

Figure 134.3 Mechanical interpolator unit, exploded view—Continued.

(52). Remove sector gear (52) and sector arm assembly (20) from counter frame (19). Refer to the note following (2) above if there are shim washers on sector arm (20).

(17) Remove the roll pin (not shown) that attaches counter wheel (65) to drive shaft (24).

(18) Remove drive shaft (24) from counter frame (19), along with counter wheels (63 and 65), shim washer (64), and any additional shim washers. Refer to the note following (2) above.

(19) Remove retaining rings (60 and 61) from counter wheel shaft (18).

(20) Remove counter wheel shaft (18) from counter frame (19), along with counter wheels (92, 94, 96, 98, 100, 85, and 87), idler shaft carrier (58), shim washers (90, 91, 93, 95, 97, 99, 84, 86, 88, 89, 56, and 57), and any additional shims. Refer to the note following (2) above.

f. Assembly of Frequency Counter Dial Assembly (fig. 134.4).

(1) Insert counter wheel shaft (18) into counter frame (19) and idler shaft carrier (58), along with counter wheels (92, 94, 96, 98, 100, 85 and 87), shim washers (56, 57, 90, 91, 93, 97, 99, 84, 86, 88, and 89), and any additional shims.

(2) All counter wheels are to be positioned so that the initial reading is: (17 2.3) on counter wheel (92), (4) on counter wheel (94), (3) on counter wheel (96), (8) on counter wheel (98), (3) on counter wheel (100), (16) on counter wheel (85), and (3) on counter wheel (87).

(3) Attach retaining rings (60 and 61) to counter wheel shaft (18).

(4) Insert drive shaft (24) into counter frame (19), along with counter wheel (63 and 65), shim washer (64), and any additional shim washers. The initial reading on counter wheel (63) must be (0), and the initial reading on counter wheel (65) must be (00).

(5) Insert the roll pin (not shown) that attaches counter wheel (65) to drive



Figure 134.3 Mechanical interpolator unit, exploded view—Continued.

shaft (24). Drill a 0.062 to 0.065 hole, if necessary, to press-fit the roll pin.

- (6) Insert sector arm assembly (20) and any shim washers used. The shim washers are required to properly mesh sector gear (52) and counter wheel (63).
- (7) Attach sector gear (52) to sector arm assembly (20) with roll pin (53). The teeth of sector gear (52) must be oriented 180° from the tab on sector arm assembly (20).

Note. When counter wheels (63 and 65) are positioned 1 revolution counterclockwise from their initial (0 00) position, sector gear (52) will be in its maximum downward engaged position.

- (8) Attach dial mask (28) to counter frame (19) with two 2-56 screws (27) and two lockwashers (26).
- (9) Install gear clamp (22) and level gear (23) on drive shaft (24), and secure with 4-40 screw (21).
- (10) Install idler shaft (55), idler pinions (69, 73, 77, and 81), idler shaft posts (67, 71, 75, and 79), and shim washers (66, 68, 70, 72, 74, 76, 78, 80, 82, and 83) on idler shaft carrier (58).

Note. Vary the number, location, and thickness of shims used on the shafts of the counter assembly to obtain lateral alignment of gear teeth.

- (11) Secure idler shaft (55) to idler shaft carrier (58) with retaining rings (54 and 59).
- (12) Insert drive shaft (51) in counter frame (19), along with spur gear (38), cluster gears (40, 42, and 49), drive shaft posts (39 and 41), gear clamps (44 and 47), flat washer (43), and any additional flat washers.
- (13) Attach drive shaft (51) with retaining rings (37 and 50).
- (14) Align cluster gear (49) on drive shaft (51) for proper mesh, and secure by tightening 4-40 screw (46) on gear clamp (47).
- (15) Align cluster gear (42) on drive shaft (51) for proper mesh, and secure by tightening 4-40 screw (45) on gear clamp (44).
- (16) Attach cluster gear (31) to counter frame (19) with retaining ring (32).

- (17) Install gear clamp (35) and level gear (33) on the end of drive shaft (51). Adjust mesh with cluster gear (31), and secure gear clamp (35) with 4-40 screw (34).
- (18) Attach spring (10) to spring clip (9). Attach spring clip (9) to counter frame (19), with 4-40 screw (15) and 4-40 nut (8).
- (19) Insert pinion shaft (16) and pinions (11 through 14) in counter frame (19). Secure pinion shaft (16) with retaining rings (17).
- (20) Attach spur gear (29) to counter frame (19), with retaining ring (30); use shims if necessary to adjust mesh with cluster gear (31).
- (21) Insert spool gear shaft (62) in counter frame (19); align with short spool gear (1), long spool gears (3 and 5), and shim washers (2 and 4). Adjust the shims, if required, to insure correct mesh of spool gears.
- (22) Secure spool gear shaft (62) with retaining rings (6 and 7).
- (23) Lubricate all rotating parts except pinion (13) with MIL-G-3278 grease (Esso Beacon 325).
- (24) Replace the frequency counter assembly (para 124l).

g. Disassembly of Exciter-Monitor Main Gear Train (fig. 134.6). The procedures given in paragraph 124 must be performed prior to the disassembly described below.

- (1) Remove four 8-32 screws (2) and split lockwashers (3) from the four corners of gear plate (1).
- (2) Disconnect switch arm spring (24) from 5-kc switch arm (20) and spring lug (27).
- (3) Remove 4-40 screw (4) from the plunger of solenoid (5).
- (4) Loosen 4-40 screw (11) and remove bevel gear (14) and gear clamp (13) from spur gear (136).
- (5) Loosen 4-40 screw (15) and slide 5-kc switch cam (18) and gear clamp (17) from spur gear (136).
- (6) Remove retaining ring (21) from 5-kc switch arm post (19), freeing 5-kc switch arm (20).

1	Spool gear, short (0841)	51	Shaft, drive (long)
2	Washer, shim	52	Gear, sector (0837)
3	Spool gear, long (0839)	53	Pin, roll
4	Washer, shim	54	Ring, retaining
5	Spool gear, long (0840)	55	Shaft, idler
6	Ring, retaining	56	Washer, shim
7	Ring, retaining	57	Washer, shim
8	Nut, machine, 4-40	58	Carrier, idler shaft
9	Clip, spring	59	Ring, retaining
10	Spring (0843)	60	Ring, retaining
11	Pinion, 8 teeth (0816)	61	Ring, retaining
12	Pinion, 8 teeth (0817)	62	Shaft, spool gear
13	Pinion, 8 teeth (0818)	63	Wheel, counter
14	Pinion, 8 teeth (0819)	64	Washer, shim
15	Screw, machine, No. 4-40, $\frac{3}{8}$ in. long	65	Wheel, counter
16	Shaft, pinion	66	Washer, shim
17	Ring, retaining	67	Post, idler shaft
18	Shaft, counter wheel	68	Washer, shim
19	Frame, counter	69	Pinion, idler, 16 teeth (0821)
20	Arm assembly, sector (0842)	70	Washer, shim
21	Screw, machine, No. 4-40, $\frac{1}{2}$ in. long	71	Post, idler shaft
22	Clamp, gear (0844)	72	Washer, shim
23	Gear, level, 36 teeth (0835)	73	Pinion, idler, 16 teeth (0822)
24	Shaft, drive (short)	74	Washer, shim
25	Nut, machine, 4-40	75	Post, idler shaft
26	Lockwasher	76	Washer, shim
27	Screw, machine, No. 2-56, $\frac{1}{4}$ in. long	77	Pinion, idler, 16 teeth (0823)
28	Mask, dial	78	Washer, shim
29	Gear, spur, 30 teeth (0834)	79	Post, idler shaft
30	Ring, retaining	80	Washer, shim
31	Gear, cluster, 24 teeth and 30 teeth (0833)	81	Pinion, idler, 16 teeth (0824)
32	Ring, retaining	82	Washer, shim
33	Gear, level, 24 teeth (0831)	83	Washer, shim
34	Screw, machine, No. 4-40, $\frac{1}{2}$ in. long	84	Washer, shim
35	Clamp, gear (0845)	85	Wheel, counter
36	Nut, machine, 4-40	86	Washer, shim
37	Ring, retaining	87	Wheel, counter
38	Gear, spur, 32 teeth (0827)	88	Washer, shim
39	Post, drive shaft (short)	89	Washer, shim
40	Gear, cluster, 32 teeth	90	Washer, shim
41	Post, drive shaft (long)	91	Washer, shim
42	Gear, cluster, 32 teeth (0829 and 0830)	92	Wheel, counter
43	Washer, flat	93	Washer, shim
44	Clamp, gear	94	Wheel, counter
45	Screw, machine, No. 4-40, $\frac{1}{2}$ in. long	95	Washer, shim
46	Screw, machine, No. 4-40, $\frac{1}{2}$ in. long	96	Wheel, counter
47	Clamp, gear (0846)	97	Washer, shim
48	Nut, machine, 4-40	98	Wheel, counter
49	Gear, cluster, 32 teeth (0828)	99	Washer, shim
50	Ring, retaining	100	Wheel, counter

Figure 134.4 Frequency counter dial assembly, exploded view.

- (7) Remove two 8-32 screws (22) that attach actuator switch (23) to 5-kc switch arm (20).
- (8) Remove 6-32 screw (25), lockwasher (26), and spring lug (27) from gear plate (1).
- (9) Loosen 4-40 screw (29) and remove counter drive spur gear (28) and gear clamp (31) from the shaft of spur gear (56).
- (10) Remove 8-32 screw (33) and lockwasher (34) from gear plate (1).
- (11) Remove 6-32 screw (35) and lockwasher (36) from gear plate (1).

- (12) Remove gear plate (1) from the remainder of the assembly.

Note. The bearings may remain attached to gear plate (1) for their respective shafts. The gear trains are under tension of the dial cord springs.

- (13) Refer to figure 134.5, which provides dial cord stringing information. Remove dial cord (78, fig. 134.6) and dial cord loading springs (147, 148, and 162) from dial pulleys (72, 77, 86, 149, and 163).
- (14) Remove 8-32 screw (41), lockwasher (46), and post (38) from gear plate (1).

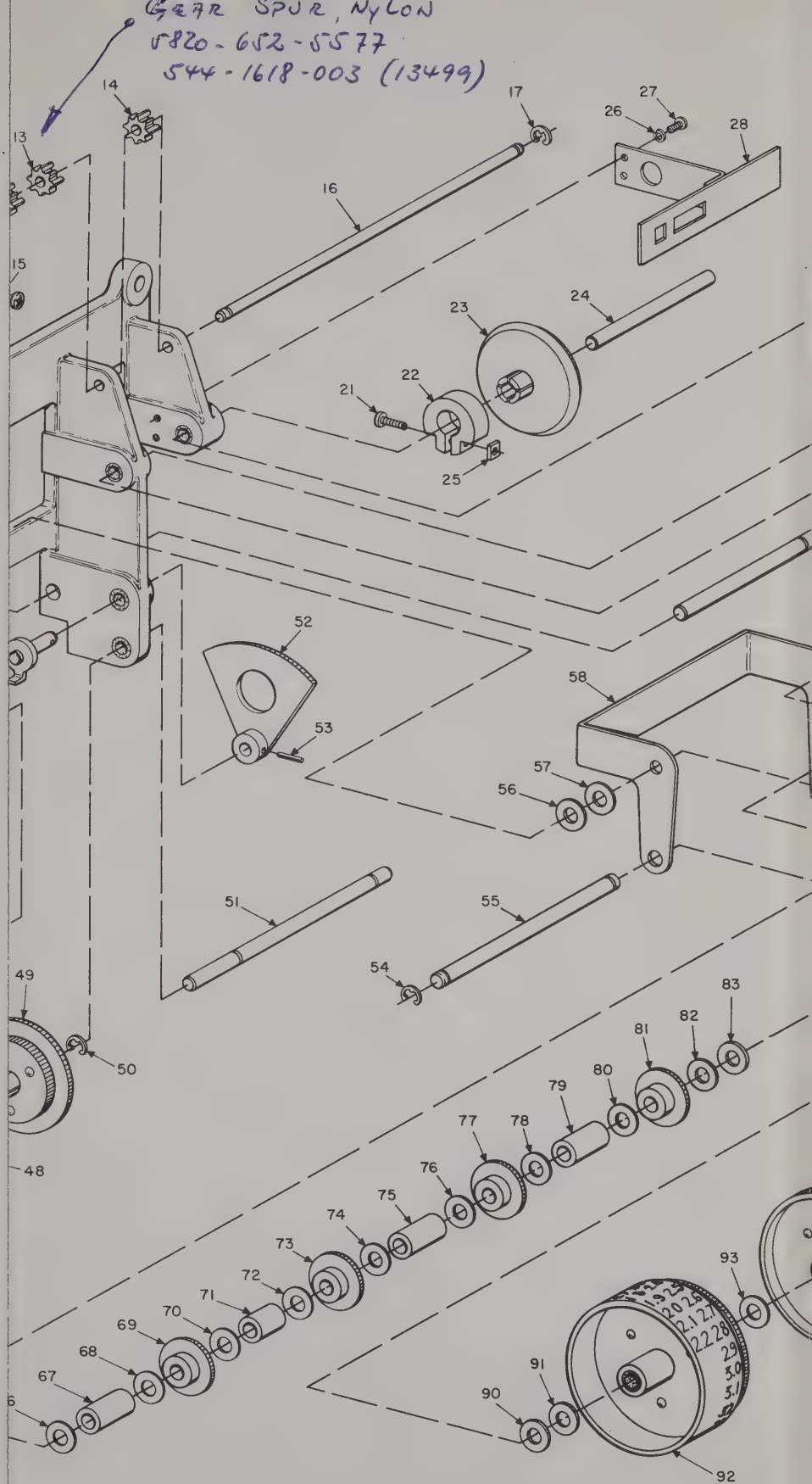


Figure 134.4 Frequency counter dial assembly, exploded view—Continued.

1 Spool gear, short (0841)	51 Shaft, drive (long)
2 Washer, shim	52 Gear, sector (0837)
3 Spool gear, long (0839)	53 Pin, roll
4 Washer, shim	54 Ring, retaining
5 Spool gear, long (0840)	55 Shaft, idler
6 Ring, retaining	56 Washer, shim
7 Ring, retaining	57 Washer, shim
8 Nut, machine, 4-40	58 Carrier, idler shaft
9 Clip, spring	59 Ring, retaining
10 Spring (0843)	60 Ring, retaining
11 Pinion, 8 teeth (0816)	61 Ring, retaining
12 Pinion, 8 teeth (0817)	62 Shaft, spool gear
13 Pinion, 8 teeth (0818)	63 Wheel, counter
14 Pinion, 8 teeth (0819)	64 Washer, shim
15 Screw, machine, No. 4-40, $\frac{3}{8}$ in. long	65 Wheel, counter
16 Shaft, pinion	66 Washer, shim
17 Ring, retaining	67 Post, idler shaft
18 Shaft, counter wheel	68 Washer, shim
19 Frame, counter	69 Pinion, idler, 16 teeth (0821)
20 Arm assembly, sector (0842)	70 Washer, shim
21 Screw, machine, No. 4-40, $\frac{1}{2}$ in. long	71 Post, idler shaft
22 Clamp, gear (0844)	72 Washer, shim
23 Gear, level, 36 teeth (0835)	73 Pinion, idler, 16 teeth (0822)
24 Shaft, drive (short)	74 Washer, shim
25 Nut, machine, 4-40	75 Post, idler shaft
26 Lockwasher	76 Washer, shim
27 Screw, machine, No. 2-56, $\frac{1}{4}$ in. long	77 Pinion, idler, 16 teeth (0823)
28 Mask, dial	78 Washer, shim
29 Gear, spur, 30 teeth (0834)	79 Post, idler shaft
30 Ring, retaining	80 Washer, shim
31 Gear, cluster, 24 teeth and 30 teeth (0833)	81 Pinion, idler, 16 teeth (0824)
32 Ring, retaining	82 Washer, shim
33 Gear, level, 24 teeth (0831)	83 Washer, shim
34 Screw, machine, No. 4-40, $\frac{1}{2}$ in. long	84 Washer, shim
35 Clamp, gear (0845)	85 Wheel, counter
36 Nut, machine, 4-40	86 Washer, shim
37 Ring, retaining	87 Wheel, counter
38 Gear, spur, 32 teeth (0827)	88 Washer, shim
39 Post, drive shaft (short)	89 Washer, shim
40 Gear, cluster, 32 teeth	90 Washer, shim
41 Post, drive shaft (long)	91 Washer, shim
42 Gear, cluster, 32 teeth (0829 and 0830)	92 Wheel, counter
43 Washer, flat	93 Washer, shim
44 Clamp, gear	94 Wheel, counter
45 Screw, machine, No. 4-40, $\frac{1}{2}$ in. long	95 Washer, shim
46 Screw, machine, No. 4-40, $\frac{1}{2}$ in. long	96 Wheel, counter
47 Clamp, gear (0846)	97 Washer, shim
48 Nut, machine, 4-40	98 Wheel, counter
49 Gear, cluster, 32 teeth (0828)	99 Washer, shim
50 Ring, retaining	100 Wheel, counter

Figure 134.4 Frequency counter dial assembly, exploded view.

- (7) Remove two 8-32 screws (22) that attach actuator switch (23) to 5-kc switch arm (20).
- (8) Remove 6-32 screw (25), lockwasher (26), and spring lug (27) from gear plate (1).
- (9) Loosen 4-40 screw (29) and remove counter drive spur gear (28) and gear clamp (31) from the shaft of spur gear (56).
- (10) Remove 8-32 screw (33) and lockwasher (34) from gear plate (1).
- (11) Remove 6-32 screw (35) and lockwasher (36) from gear plate (1).

- (12) Remove gear plate (1) from the remainder of the assembly.

Note. The bearings may remain attached to gear plate (1) for their respective shafts. The gear trains are under tension of the dial cord springs.

- (13) Refer to figure 134.5, which provides dial cord stringing information. Remove dial cord (78, fig. 134.6) and dial cord loading springs (147, 148, and 162) from dial pulleys (72, 77, 86, 149, and 163).
- (14) Remove 8-32 screw (41), lockwasher (46), and post (38) from gear plate (1).

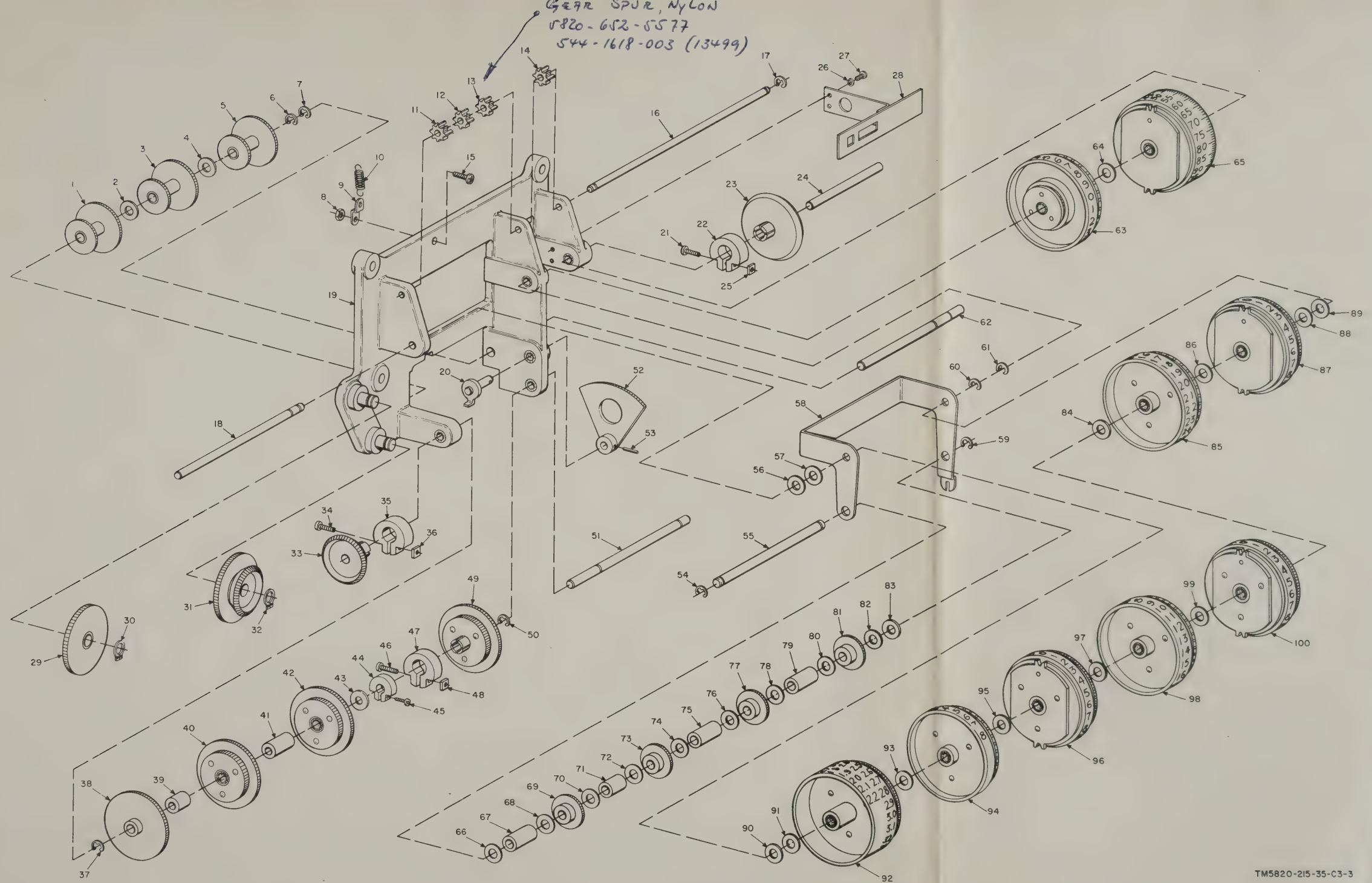
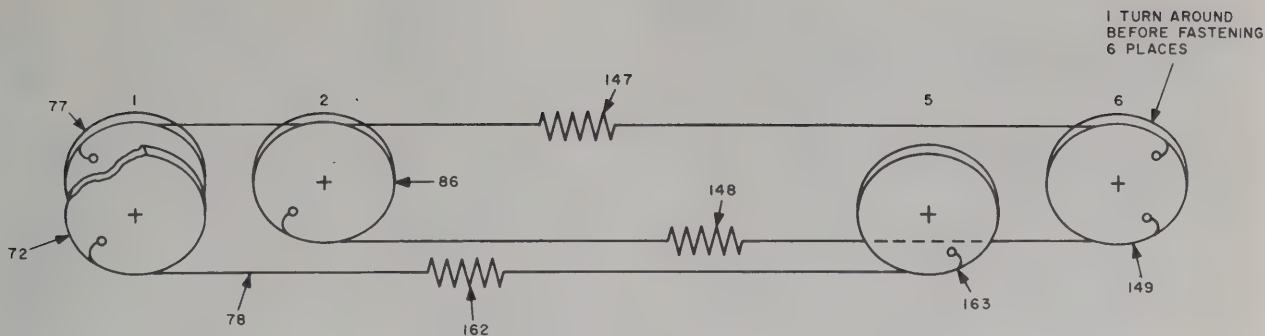


Figure 134.4 Frequency counter dial assembly, exploded view—Continued.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100



TM5820-215-35-C3-4

Figure 134.5 Exciter-monitor, dial cord stringing diagram.

- (15) Remove 8-32 screw (47), lockwasher (48), and post (37) from gear plate (1).
- (16) Remove 8-32 screw (42) and 5-kc switch arm post (19) from gear plate (1).
- (17) Remove two 8-32 screws (40) and solenoid (5) from gear plate (1).
- (18) Remove 6-32 screw (44), lockwasher (45), and counter post (73) from gear plate (1).
- (19) Remove cam adjusting screw (8), lockwasher (9), and positioning cam (10) from gear plate (1).
- (20) Remove 6-32 screw (50), lockwasher (51), and spacer (39) from gear plate (1).
- (21) Remove 6-32 screw (52), lockwasher (53), and counter post (32) from gear plate (1).
- (22) Remove ball bearing (69) and retaining ring (70) from cluster gear (75). Remove four 6-32 capnuts (71) and dial pulley (72) from cluster gear (75).
- (23) Loosen 4-40 screw (173) and remove coupler clamp (174) and split hub coupler (176) from the shaft of spur gear (89).
- (24) Remove spur gear (89) with the attached parts. Remove ball bearings (82 and 95), retaining ring (85), four 6-32 screws (83), four lockwashers (84), dial pulley (86), four spacers (88), retaining ring (94), spacer (93), gear hub (92), spur gear (91), and gear hub (90) from the shaft of spur gear (89).
- (25) Loosen 4-40 screw (169) and remove coupler clamp (170) and split hub coupler (172) from cluster gear (75).
- (26) Remove cluster gear (75) and the attached items from spur gear (160). Remove ball bearing (80), retaining ring (79), four 6-32 screws (81), dial pulley (77), four spacers (74), and four spacers (76) from cluster gear (75).
- (27) Loosen 4-40 screw (181) and remove coupler clamp (182) and split hub coupler (184) from the shaft of spur gear (123).
- (28) Remove ball bearing (121) from the shaft of spur gear (123).
- (29) Remove spur gear (123) and the attached parts from main gear plate (168). Remove ball bearing (129), retaining ring (123), spacer (127), gear hub (126), spur gear (125), and gear hub (124) from the shaft of spur gear (123).
- (30) Loosen 4-40 screw (177) and remove coupler clamp (178) and split hub coupler (180) from the shaft of spur gear (118).
- (31) Remove ball bearing (112) from the shaft of spur gear (118).
- (32) Remove spur gear (118) and its attached parts from main gear plate (168). Remove ball bearing (120), retaining ring (119), retaining ring (113), spacer (114), gear hub (115),

- spur gear (116), and gear hub (117) from the shaft of spur gear (118).
- (33) Loosen 4-40 screw (189) and remove coupler clamp (209) and split hub coupler (191) from the shaft of spur gear (151).
 - (34) Remove ball bearing (143) from the shaft of spur gear (151).
 - (35) Remove spur gear (151) and the attached parts from main gear plate (168). Remove lockwasher (144), four 6-32 screws (145), four lockwashers (146), dial pulley (149), four spacers (150), ball bearing (153), and lockwasher (152) from the shaft of spur gear (151).
 - (36) Loosen 4-40 screw (185) and remove coupler clamp (186) and split hub coupler (188) from the shaft of spur gear (160).
 - (37) Remove ball bearing (154) from the shaft of spur gear (160).
 - (38) Remove spur gear (160) and the attached parts from main gear plate (168). Remove retaining ring (155), spacer (156), gear hub (157), spur gear (158), gear hub (159), ball bearing (167), retaining ring (166), four 6-32 screws (165), from retaining rings (164), dial pulley (163), and four spacers (161) from the shaft of spur gear (160).
 - (39) Loosen 4-40 screw (139) and remove pulley (138), pulley clamp (141), lockwasher (142), flat washer (195), retaining ring (194), and split hub coupler (192) from the shaft of spur gear (193). Remove spur gear (193) from main gear plate (168).
 - (40) Remove 1/4-20 screw (196), lockwasher (197), flat washer (198), and idler pulley bracket (201) from spur gear (160).
 - (41) Remove 6-32 screw (199), lockwasher (200), bushing (204), pulley hub (203), and idler pulley (202) from idler pulley bracket (201). Remove belt (342) from switch drive pulley (334).
 - (42) Remove belt (224) from compound pulley (223) and pulley (232).
 - (43) Remove 6-32 shaft bolt (228), lockwasher (229), flat washer (230), spacer (231), hub pulley (232), and pulley spool (233) from main gear plate (168).
 - (44) Remove belt (211) from hub pulley (212) and compound pulley (223).
 - (45) Remove 6-32 screw (396), lockwasher (397), retaining ring (225), spacer (226), compound pulley (223), and spacer (227) from pulley shaft (344).
 - (46) Remove 6-32 screws (217 and 220), flat washers (218 and 221), grommets (219 and 222), and the motor assembly from main gear plate (168).
 - (47) Remove taper pin (213) from the hub pulley (212) and the shaft of motor (216).
 - (48) Remove retaining ring (343), washer (210), hub pulley (212), washer (214), and retaining ring (215) from the shaft of motor (216).
 - (49) Remove taper pin (235) from the hub of spur gear (234) and pulley shaft (239).
 - (50) Remove spur gear (234), bearing housing (236), ball bearing (237), retaining rings (238 and 241), pulley shaft (239), taper pin (242), and pulley (240) from main gear plate (168).
 - (51) Remove 6-32 screws (253, 256, 259, and 261), lockwashers (254, 258, 260, and 262), flat washers (255 and 263), and auxiliary plate E (446) from main gear plate (168). Remove 6-32 screw (375) and post (443) from auxiliary plate E (446).
 - (52) Remove 6-32 screws (303, 306, 308), lockwashers (304, 307, 309), and auxiliary plate B (310) from main gear plate (168).
 - (53) Remove 6-32 screws (264, 266, 268, 270), lockwashers (265, 267, 269, 271), and auxiliary gear plate (272) from main gear plate (168).
 - (54) Remove ball bearing (323), retaining ring (324), cluster gear (325), spacer (326), spur gear (327), retaining ring (328), and ball bearing (329) from main gear plate (168).
 - (55) Loosen 4-40 screw (368), and remove split hub coupler (367) and coupling clamp (370) from gear shaft (313).

- (56) Loosen 4-40 screw (346) and remove interpolator input gear (345) and gear clamp (348) from the shaft of spur gear (322).
- (57) Loosen 4-40 screw (356), and remove split hub coupler (355) and coupler clamp (358) from the shaft of spur gear (291).
- (58) Remove 6-32 screws (349, 351, and 353), lockwashers (350, 352, and 354), and bearing plate (359).
- (59) Remove sleeve bearing (363), split lockwashers (364 and 365), and ball bearing (366) from the shaft of spur gear (322).
- (60) Remove 6-32 screw (441), retaining ring (336), flat washer (335), switch drive pulley (334), split hub coupler (333), and pulley shaft (332).
- (61) Loosen 4-40 screw (402) and remove split hub coupler (401) and coupler clamp (404) from shaft spur gear (257).
- (62) Remove 6-32 screws (405, 407, and 409) and lockwashers (406, 408, and 410) from bearing plate (411). Remove bearing plate (411) from posts (412, 413, and 414).
- (63) Loosen 4-40 screws (417 and 422). Remove sleeve bearing (415), retaining ring (416), gear clamp (419), spur gears (420 and 421), gear clamp (424), retaining ring (425), and sleeve bearing (426) from spur gear shaft (257). Remove spur gear shaft (257) from main gear plate (168).
- (64) Remove ball bearing (247), retaining ring (246), spur gears (245 and 244), and ball bearing (243) from main gear plate (168).
- (65) Remove ball bearing (252), retaining ring (251), spur gears (250 and 249), and ball bearing (248) from main gear plate (168).
- (66) Remove retaining ring (318), spur gear (319), spacer (320), and gear spring (321) from spur gear (322). Remove spur gear (322) from main gear plate (168).
- (67) Remove taper pin (316) from spur gear (315) and gear shaft (313).
- (68) Remove gear shaft (313), sleeve bearing (314), spur gear (315), and ball bearing (317) from main gear plate (168).
- (69) Remove ball bearings (295 and 302), retaining rings (300 and 301), and spring-loading gear assembly (297, 298, and 299) from main gear plate (168).
- (70) Remove spring (298) from spur gear (297 on 299). Remove spur gear (299) from the shaft of spur gear (297).
- (71) Remove ball bearing (286), ball bearing (294), and compound gear assembly (289, 291, and 292) from main gear plate (168).
- (72) Remove taper pin (293) from spur gear (292) and the shaft of spur gear (291).
- (73) Remove retaining rings (287 and 288), spur gear (289), and gear spring (290) from spur gear (291).
- (74) Remove ball bearings (277 and 285) and compound gear assembly (279, 280, 281, and 282) from main gear plate (168).
- (75) Remove retaining rings (278, 283, and 284), spur gear (279), spur gear (282), and gear spring (281) from spur gear (280).
- (76) Remove 6-32 screw (337), retaining rings (106, 107, and 111), spur gears (108 and 109), and gear shaft (110) from main gear plate (168).
- (77) Remove ball bearings (96 and 105) and compound gear assembly (99, 101, and 104) from main gear plate (168).
- (78) Remove taper pin (98) from spur gear (99) and the shaft of spur gear (104).
- (79) Remove retaining rings (97 and 100), spur gear (99), spur gear (101), and loading springs (102 and 103) from spur gear (104).
- (80) Remove 6-32 screw (398) and post (430) from main gear plate (168).
- (81) Remove three 6-32 screws (427, 429, and 432) and posts (412, 413, and 414) from main gear plate (168).
- (82) Remove 6-32 screw (394) and post (431) from main gear plate (168).

- (83) Remove 6-32 screw (393) and post (433) from main gear plate (168).
- (84) Remove 6-32 screw (385), lockwasher (386), and post (436) from main gear plate (168).
- (85) Remove 6-32 screw (391) and post (434) from main gear plate (168).
- (86) Remove 6-32 screw (395) and post (445) from main gear plate (168).
- (87) Remove 6-32 screw (338) and post (440) from main gear plate (168).
- (88) Remove 6-32 screw (372), lockwasher (373), and post (435) from main gear plate (168).
- (89) Remove three 6-32 screws (437, 438, and 439), and posts (360, 361, and 362) from main gear plate (168).
- (90) Remove 6-32 screw (380), lockwasher (381), and post (275) from main gear plate (168).
- (91) Remove 6-32 screw (387), lockwasher (388), and post (276) from main gear plate (168).
- (92) Remove 8-32 screw (399), lockwasher (400), and post (392) from main gear plate (168).
- (93) Remove 6-32 screw (340), lockwasher (341), and post (305) from main gear plate (168).
- (94) Remove 6-32 screw (330), lockwasher (331), and post (49) from main gear plate (168).
- (95) Remove 6-32 screw (384) and post (55) from main gear plate (168).
- (96) Remove 6-32 screw (207), lockwasher (208), and post (339) from main gear plate (168).
- (168) with 8-32 screw (399) and lockwasher (400).
- (6) Install post (276) on main gear plate (168) with 6-32 screw (387) and lockwasher (388).
- (7) Install post (275) on main gear plate (168) with 6-32 screw (380) and lockwasher (381).
- (8) Install posts (360, 361, and 362) on main gear plate (168) with 6-32 screws (437, 438, and 439).
- (9) Install post (435) on main gear plate (168) with 6-32 screw (372) and lockwasher (373).
- (10) Install post (440) on main gear plate (168) with 6-32 screw (338).
- (11) Install post (445) on main gear plate (168) with 6-32 screw (395).
- (12) Install post (434) on main gear plate (168) with 6-32 screw (391).
- (13) Install post (436) on main gear plate (168) with 6-32 screw (385) and lockwasher (386).
- (14) Install post (433) on main gear plate (168) with 6-32 screw (393).
- (15) Install post (431) on main gear plate (168) with 6-32 screw (394).
- (16) Install posts (412, 413, and 414) on main gear plate (168) with 6-32 screws (427, 429, and 432).
- (17) Install post (430) on gear plate (168) with 6-32 screw (398).
- (18) Assemble spur gears (101 and 104) with retaining ring (100). Place spur gear (99) on the shaft of spur gear (104) with the hub side outward, and secure to the shaft with taper pin (98). Attach retaining ring (97) to the shaft of spur gear (104). Connect loading springs (102 and 103) to spur gears (101 and 104).
- (19) Install ball bearings (96 and 105) on the shaft of spur gear (104), and set this assembly in place on main gear plate (168) with spur gear (104) nearest the gear plate.
- (20) Assemble spur gears (108 and 109) on gear shaft (110) with retaining rings (106, 107, and 111), and attach this assembly to main gear plate (168) with 6-32 screw (337).
- (21) Assemble spur gears (280 and 282)

h. Assembly of Exciter-Monitor Main Gear Train (fig. 134.6).

- (1) Install post (339) on main gear plate (168) with 6-32 screw (207) and lockwasher (208).
- (2) Install post (55) on main gear plate (168) with 6-32 screw (348).
- (3) Install post (49) on main gear plate (168) with 6-32 screw (330) and lockwasher (331).
- (4) Install post (305) on main gear plate (168) with 6-32 screw (340) and lockwasher (341).
- (5) Install post (392) on main gear plate

- and secure with retaining rings (283 and 284).
- (22) Assemble spur gear (279) to the shaft of spur gear (280) with retaining ring (278).
 - (23) Attach the loading spring (281) to spur gears (280 and 282).
 - (24) Place ball bearings (277 and 285) on the shaft of spur gear (280), and install this assembly on main gear plate (168).
 - (25) Assemble spur gears (289 and 291) and secure with retaining rings (287 and 288).
 - (26) Attach spur gear (292) to the shaft of spur gear (291) with taper pin (293).
 - (27) Attach loading spring (290) to spur gears (289 and 291).
 - (28) Place ball bearings (286 and 294) on the shaft of spur gear (291), and install this assembly on main gear plate (168).
 - (29) Assemble spur gears (297 and 299) and secure with retaining rings (296, 300, and 301).
 - (30) Attach loading spring (298) to spur gears (297 and 299).
 - (31) Place ball bearings (295 and 302) on the shaft of spur gear (297), and install this assembly on main gear plate (168).
 - (32) Assemble spur gear (315), sleeve bearing (314), and shaft (313), and secure with taper pin (316).
 - (33) Place ball bearing (317) on shaft (313) and install this assembly on main gear plate (168).
 - (34) Assemble spur gears (319 and 322) with spacer (320) and gear spring (321) between the gear faces. Secure this assembly with retaining ring (318).
 - (35) Install bearing (366) on main gear plate (168) and slide the shaft of spur gear (322) into ball bearing (366). Secure the shaft with lockwashers (364 and 365).
 - (36) Assemble spur gears (249 and 250) with retaining ring (251).
 - (37) Place ball bearings (248 and 252) on the shaft of spur gear (249), and install this assembly on main gear plate (168).
 - (38) Assemble spur gears (244 and 245) with retaining ring (246).
 - (39) Place ball bearings (243 and 247) on the shaft of spur gear (244), and install this assembly on main gear plate (168).
 - (40) Insert sleeve bearing (426) in gear plate (168). Insert shaft (257) in sleeve bearing (426), and secure with retaining ring (425).
 - (41) Place gear clamp (424) and spur gear (421) on shaft (257), and tighten 4-40 screw (422) to secure spur gear (421) to the shaft.
 - (42) Place spur gear (420) and gear clamp (419) on shaft (257), and tighten 4-40 screw (417) to secure spur gear (420) to the shaft.
 - (43) Attach retaining ring (416) to shaft (257), and place sleeve bearing (415) on shaft (257).
 - (44) Attach bearing plate (411) to posts (412, 413, and 414), guiding shaft (257), and sleeve bearing (415) into the counterbore on bearing plate (411).
 - (45) Attach bearing plate (411) to posts (412, 413, and 414) with three 6-32 screws (405, 407, and 409) and three lockwashers (406, 408, and 410).
 - (46) Place coupler clamp (404) and split hub coupler (401) on shaft (257) and secure the split hub coupler by tightening 4-40 screw (402).
 - (47) Assemble split hub coupler (333) and switch drive pulley (334) to pulley shaft (332), and secure with flat washer (335) and retaining ring (336). Place this assembly in position on main gear plate (168) and secure with 6-32 screw (441).
 - (48) Insert sleeve bearing (363) in the counterbore of bearing plate (359).
 - (49) Fit bearing plate (359) on spur gears (322 and 297). Secure to posts (360, 361, and 362) with three 6-32 screws (349, 351, and 353) and three lockwashers (350, 352, and 354).
 - (50) Place gear clamp (348) and interpolator input gear (345) on the shaft of

- spur gear (322), and secure with 4-40 screw (346).
- (51) Place coupler clamp (358) and split hub coupler (355) on the shaft of spur gear (297), and secure with 4-40 screw (356).
 - (52) Place coupling clamp (370) and split hub coupler (367) on gear shaft (313) and secure with 4-40 screw (368).
 - (53) Assemble cluster gear (325), spacer (326), and spur gear (327); secure with retaining rings (324 and 328).
 - (54) Place ball bearings (323 and 329) on the shaft of cluster gear (325) and install this assembly on main gear plate (168).
 - (55) Fit gear plate (272) over posts (273, 274, and 276) and ball bearings (277, 286, 295, and 323). Secure with 6-32 screws (264, 266, 268, and 270) and lockwashers (265, 267, 269, and 271).
 - (56) Fit auxiliary plate B (310) over gear shaft (313) and posts (305, 311, and 312). Secure with 6-32 screws (303, 306, and 308) and lockwashers (304, 307, and 309).
 - (57) Attach post (433) to auxiliary plate E (446) with 6-32 screw (375).
 - (58) Fit auxiliary plate E (446) over posts (442, 443, 444, and 445), gear shaft (257), and ball bearings (247 and 252). Secure with 6-32 screws (253, 256, 259, and 261), flat washer (263, and lockwashers (254, 258, 260, and 262).
 - (59) Preassemble pulley (240), ball bearing (237), ball bearing housing (236), and spur gear (234) to pulley shaft (239). Secure pulley (240) with taper pin (242) and retaining ring (241). Attach retaining ring (238) to pulley shaft (239). Attach spur gear (234) to pulley shaft (239) with taper pin (235). Install this assembly on main gear plate (168).
 - (60) Place washers (210 and 214) and hub pulley (212) on the shaft of motor (216). Attach the pulley to the motor shaft with taper pin (213). Secure this assembly with retaining rings (343 and 215).
 - (61) Attach the completed motor assembly to main gear plate (168) with grommets (219 and 222), flat washers (218 and 221), and 6-32 screws (217 and 220).
 - (62) Attach retaining ring (428) to shaft (344), and secure the shaft to main gear plate (168) with 6-32 screw (396) and lockwasher (397). Install spacer (227), compound pulley (223), and spacer (226) on ball bearing (243). Secure with retaining ring (225).
 - (63) Install belt (211) on hub pulley (212) and large diameter of compound pulley (223).
 - (64) Place lockwasher (229), flat washer (230), spacer (231), hub pulley (232), and pulley spool (233) on shaft bolt (228).
 - (65) Place belt (376) on pulley (240). Attach this assembly on shaft bolt (228) to main gear plate (168), passing pulley spool (233) through belt (376) on pulley (240).
 - (66) Install belt (224) on hub pulleys (212 and 232).
 - (67) Assemble hub bushing (204), pulley sleeve (203), idler pulley (202), and idler pulley bracket (201) with 6-32 screw (199) and lockwasher (200).
 - (68) Place belt (342) over idler pulley (202) and attach idler pulley bracket (201) to main gear plate (168) with 6-32 screw (196), lockwasher (197), and flat washer (198).
 - (69) Assemble split hub coupler (192) and spur gear (193). Attach retaining ring (194) and flat washer (195). Install spur gear (193) on main gear plate (168), and install lockwasher (142), pulley clamp (141), and pulley (138) on the shaft of spur gear (193).
 - (70) Tighten 4-40 screw (139) to secure pulley (138).
 - (71) Install belt (342) on spur gear (193) and switch drive pulley (334).
 - (72) Preassemble spur gear (160), dial pulley (163), spur gear (158), gear hubs (157 and 159), and spacer (156). Secure dial pulley (163) with four 6-32 screws (165) and four retaining rings (164) with four spacers

- (161) between the pulley and gear faces. Secure with detaining rings (155 and 166) and install ball bearings (154 and 167) on the shaft of spur gear (160). Install this assembly in main gear plate (168).
- (73) Place coupler clamp (186) and split hub coupler (188) on the shaft of spur gear (160), and secure with 4-40 screw (189).
- (74) Preassemble spur gear (151) and dial pulley (149), using four 6-32 screws (145) and four lockwashers (146), with four spacers (150) between the pulley and gear faces.
- (75) Place lockwashers (144 and 152) and ball bearings (143 and 153) on the shaft of spur gear (151), and install this assembly on main gear plate (168).
- (76) Place coupler clamp (209) and split hub coupler (191) on the shaft of spur gear (151), and secure with 4-40 screw (189).
- (77) Preassemble spur gear (118), spur gear (116), gear hubs (115 and 117), and spacers (114), attaching with retaining rings (113 and 119).
- (78) Place ball bearings (112 and 120) on the shaft of spur gear (118), and install this assembly on gear plate (168).
- (79) Place coupler clamp (178) and split hub coupler (180) on the shaft of spur gear (118), and secure with 4-40 screw (177).
- (80) Preassemble spur gears (123 and 125), gear hubs (124 and 126), and spacer (127), attaching with retaining rings (122 and 128).
- (81) Place coupler clamp (182) and split hub coupler (184) on the shaft of spur gear (123), and secure with 4-40 screw (181).
- (82) Preassemble cluster gear (75) and dial pulleys (72 and 77) with four 6-32 screws (81), eight spacers (74 and 76), and four capnuts (71). Attach retaining rings (70 and 79) and ball bearings (69 and 80) to the shaft of cluster gear (75). Attach this assembly to main gear plate (168).
- (83) Place coupler clamp (170) and split hub coupler (172) on the shaft of cluster gear (75), and secure with 4-40 screw (169).
- (84) Preassemble spur gear (89) and dial pulley (86) with four 6-32 screws (83), four lockwashers (84), and four spacers (88). Insert gear hubs (90 and 92) in the bore of spur gear (91) and place on shaft of spur gear (89). Place spacer (93) on the shaft of spur gear (89), and secure the assembly with retaining rings (85 and 94). Place ball bearings (82 and 95) on the shaft of spur gear (89) and install this assembly on main gear plate (168).
- (85) Place coupler clamp (174) and split hub coupler (176) on the shaft of spur gear (89), and secure with 4-40 screw (173).
- (86) Attach counter post (32) to gear plate (1) with 6-32 screw (52) and lockwasher (53).
- (87) Attach spacer (39) to gear plate (1) with 6-32 screw (50) and lockwasher (51).
- (88) Refer to figure 134.5, which provides dial cord stringing information. Replace dial cord (78) and dial cord loading springs (147, 148, and 162) on dial pulleys (72, 77, 86, 149, and 163).
- (89) Attach positioning cam (10) to gear plate (1) with cam adjusting screw (8) and lockwasher (9).
- (90) Attach counterpost (73) to gear plate (1) with 6-32 screw (44) and lockwasher (45).
- (91) Attach solenoid (5) to gear plate (1) with two 8-32 screws (40).
- (92) Attach 5-kc switch arm post (19) to gear plate (1) with 8-32 screw (42).
- (93) Attach post (38) to gear plate (1) with 8-32 screw (41) and lockwasher (46).
- (94) Fit gear plate (1) over the supporting posts, shafts, and bearing of the remainder of the assembly.
- (95) Attach gear plate (1) to post (49) with 6-32 screw (35) and lockwasher (36).

- (96) Attach gear plate (1) to post (54) with 8-32 screw (33) and lockwasher (34).
- (97) Place gear clamp (31) and counter drive gear (28) on the shaft of spur gear (56), and secure with 4-40 screw (29).
- (98) Attach spring lug (27) to gear plate (1) with 6-32 screw (25) and lockwasher (26).
- (99) Attach switch (23) to 5-kc switch arm (20) with two 8-32 screws (22).
- (100) Attach 5-kc switch arm (20) to 5-kc switch arm post (19) with retaining ring (21).
- (101) Attach gear clamp (17) and 5-kc switch cam (18) to the shaft of spur gear (136) with 4-40 screw (15).
- (102) Attach gear clamp (13) and bevel gear (14) to the shaft of spur gear (136), with 4-40 screw (11).
- (103) Attach 5-kc switch arm (20) to the plunger of solenoid (5) with 4-40 screw (4).
- (104) Connect switch arm spring (24) between 5-kc switch arm (20) and spring lug (27).
- (105) Attach the four corners of gear plate (1) with four 8-32 screws (2) and four lockwashers (3).
- (106) Lubricate all moving parts except the

- | | |
|---|---|
| 1 Plate, gear (includes 0899.298) | 49 Post |
| 2 Screw, machine, No. 8-32 | 50 Screw, machine, No. 6-32 |
| 3 Lockwasher | 51 Lockwasher |
| 4 Screw, machine, No. 4-40, 1/2 in. long | 52 Screw, machine, No. 6-32 |
| 5 Solenoid | 53 Lockwasher |
| 6 Screw, machine, No. 6 | 54 Post |
| 7 Lockwasher | 55 Post |
| 8 Screw, machine, cam adjusting | 56 Gear, spur |
| 9 Lockwasher | 57 Ring, retaining |
| 10 Cam, positioning | 58 Screw, machine |
| 11 Screw, machine, No. 4-40, 1/2 in. long | 59 Lockwasher |
| 12 Nut, machine, 4-40 | 60 Retainer, pivot arm |
| 13 Clamp, gear | 61 Arm, pivot |
| 14 Gear, bevel (0899.328) | 62 Shaft, pulley |
| 15 Screw, machine, No. 4-40, 1/2 in. long | 63 Flange, pulley |
| 16 Nut, machine 4-40 | 64 Hub, pulley (includes bearing 0899.312) |
| 17 Clamp, gear | 65 Ring, retaining |
| 18 Switch cam (0899.193) | 66 Sleeve, hub |
| 19 Post, switch arm | 67 Flange, pulley |
| 20 Arm, switch | 68 Ring, retaining |
| 21 Ring, retaining | 69 Bearing, ball (0899.299) |
| 22 Screw, machine, No. 8-32 | 70 Ring, retaining |
| 23 Actuator, switch (0899.403) | 71 Capnut, No. 6-32 |
| 24 Spring, switch arm (0899.339) | 72 Pulley, dial |
| 25 Screw, machine, No. 6-32 | 73 Post, counter |
| 26 Lockwasher | 74 Spacer |
| 27 Lug, spring (0899.335) | 75 Gear, cluster (0899.265) (includes 0899.314) |
| 28 Gear, spur, counter drive (0899.341) | 76 Spacer |
| 29 Screw, machine No. 4-40 1/2 in. long | 77 Pulley, dial |
| 30 Nut, machine, 4-40 | 78 Cord, dial |
| 31 Clamp, gear | 79 Ring, retaining |
| 32 Post, counter | 80 Bearing, ball (0899.297) |
| 33 Screw, machine, No. 8-32 | 81 Screw, machine, No. 6-32, sockethead |
| 34 Lockwasher | 82 Bearing, ball (0899.299) |
| 35 Screw, machine, No. 6-32 | 83 Screw, machine, No. 6-32, sockethead |
| 36 Lockwasher | 84 Lockwasher |
| 37 Post | 85 Ring, retaining |
| 38 Post | 86 Pulley, dial |
| 39 Spacer | 87 Lockwasher |
| 40 Screw, machine, No. 8-32 3/8 in. long | 88 Spacer |
| 41 Screw, machine, No. 8-32 | 89 Gear, spur (0899.259) |
| 42 Screw, machine, No. 8-32 | 90 Hub, gear (0899.260) |
| 43 Screw, machine, No. 8-32 | 91 Gear, spur (0899.258) |
| 44 Screw, machine No. 6-32 | 92 Hub, gear (0899.260) |
| 45 Lockwasher | 93 Spacer |
| 46 Lockwasher | 94 Ring, retaining |
| 47 Screw, machine, No. 8-32 | 95 Bearing, ball (0899.297) |
| 48 Lockwasher | 96 Bearing, ball (0899.324) |

Figure 134.6 Exciter-monitor main gear train, exploded view.

- 97 Ring, retaining
- 98 Pin, roll, taper (0899.235)
- 99 Gear, pinion, spur (0899.235)
- 100 Ring, retaining (0899.235)
- 101 Gear, spur (0899.235)
- 102 Spring, scissor gear (0899.410)
- 103 Spring, scissor gear (0899.411)
- 104 Gear, spur, scissor (0899.235)
- 105 Bearing, ball (0899.324)
- 106 Ring, retaining
- 107 Ring, retaining
- 108 Gear, spur (0899.247)
- 109 Gear, spur (0899.244) (includes bearing 0899.245)
- 110 Shaft, gear
- 111 Ring, retaining
- 112 Bearing, ball (0899.299)
- 113 Ring, retaining
- 114 Spacer
- 115 Hub, gear (0899.252)
- 116 Gear, spur (0899.250)
- 117 Hub, gear (0899.252)
- 118 Gear, spur (0899.251)
- 119 Ring, retaining
- 120 Bearing, ball (0899.297)
- 121 Bearing, ball (0899.299)
- 122 Ring, retaining
- 123 Gear, spur (0899.271)
- 124 Hub, gear (0899.272)
- 125 Gear, spur (0899.270)
- 126 Hub, gear (0899.272)
- 127 Spacer
- 128 Ring, retaining
- 129 Bearing, ball (0899.297)
- 130 Spool, spacer
- 131 Ring, retaining
- 132 Ring, retaining
- 133 Gear, spur, scissor
- 134 Spring, scissor gear (0899.412)
- 135 Spring, scissor gear (0899.413)
- 136 Gear, spur, scissor (0899.222)
- 137 Ring, retaining
- 138 Pulley
- 139 Screw, machine, No. 4-40, ½ in. long
- 140 Nut, machine, 4-40
- 141 Clamp, pulley
- 142 Lockwasher
- 143 Bearing, ball (0899.299)
- 144 Lockwasher
- 145 Screw, machine, No. 6-32, sockethead
- 146 Lockwasher
- 147 Spring, dial cord loading (0899.315)
- 148 Spring, dial cord loading (0899.316)
- 149 Pulley, dial
- 150 Spacer
- 151 Gear, spur (0899.285)
- 152 Lockwasher
- 153 Bearing, ball (0899.297)
- 154 Bearing, ball (0899.299)
- 155 Ring, retaining
- 156 Spacer
- 157 Hub, gear (0899.280)
- 158 Gear, spur (0899.278)
- 159 Hub, gear (0899.280)
- 160 Gear, spur (0899.279)
- 161 Spacer
- 162 Spring, dial cord loading (0899.317)
- 163 Pulley, dial
- 164 Ring, retaining
- 165 Screw, machine, 6-32 sockethead
- 166 Ring, retaining
- 167 Bearing, ball (0899.297)
- 168 Plate, main gear (includes bearing 0899.294)
- 169 Screw, machine, No. 4-40, ½ in. long
- 170 Clamp, coupler
- 171 Nut, machine, 4-40
- 172 Coupler, split hub
- 173 Screw, machine, No. 4-40, ½ in. long
- 174 Clamp, coupler
- 175 Nut, machine, 4-40
- 176 Coupler, split hub
- 177 Screw, machine, No. 4-40, ½ in. long
- 178 Clamp, coupler
- 179 Nut, machine, 4-40
- 180 Coupler, split hub
- 181 Screw, machine, No. 4-40, ½ in. long
- 182 Clamp, coupler
- 183 Nut, machine, 4-40
- 184 Coupler, split hub
- 185 Screw, machine, No. 4-40, ½ in. long
- 186 Clamp, coupler
- 187 Nut, machine, 4-40
- 188 Coupler, split hub
- 189 Screw, machine, No. 4-40, ½ in. long
- 190 Nut, machine, 4-40
- 191 Coupler, split hub
- 192 Coupler, split hub (0899.344)
- 193 Gear, spur
- 194 Ring, retaining
- 195 Washer, flat
- 196 Screw, machine, No. 6-32
- 197 Lockwasher
- 198 Washer, flat
- 199 Screw, machine, No. 6-32
- 200 Lockwasher
- 201 Bracket, idler pulley
- 202 Pulley, idler (includes bearing 0899.289)
- 203 Sleeve, pulley
- 204 Hub, pulley, bushing
- 205 Screw, machine, No. 6
- 206 Lockwasher
- 207 Screw, machine, No. 6-32
- 208 Lockwasher
- 209 Clamp, coupler
- 210 Washer
- 211 Belt (0899.320)
- 212 Hub, pulley
- 213 Pin, roll, taper
- 214 Washer
- 215 Ring, retaining
- 216 Motor
- 217 Screw, machine, No. 6-32
- 218 Washer, flat
- 219 Grommet
- 220 Screw, machine, No. 6-32
- 221 Washer, flat
- 222 Grommet
- 223 Pulley, compound
- 224 Belt (0899.321)
- 225 Ring, retaining
- 226 Spacer (0899.331)
- 227 Spacer
- 228 Shaft bolt, No. 6-32
- 229 Lockwasher
- 230 Washer, flat
- 231 Spacer (0899.331)
- 232 Pulley, hub
- 233 Spool, pulley, roller
- 234 Gear, spur (0899.302)
- 235 Pin, roll, taper
- 236 Housing, bearing
- 237 Bearing, ball (0899.301)
- 238 Ring, retaining
- 239 Shaft, pulley
- 240 Pulley
- 241 Ring, retaining
- 242 Pin, roll, taper
- 243 Bearing, ball (0899.325)
- 244 Gear, spur (0899.231)
- 245 Gear, spur (0899.194)

Figure 134.6 Exciter-monitor main gear train, exploded view—Continued.

246 Ring, retaining	321 Spring, scissor gear
247 Bearing, ball (0899.325)	322 Gear, spur (0899.205)
248 Bearing, ball (0899.324)	323 Bearing, ball (0899.324)
249 Gear, spur (0899.232)	324 Ring, retaining (0899.202)
250 Gear, spur (0899.195)	325 Gear, compound spur, cluster (0899.204)
251 Ring, retaining	326 Spacer (0899.202)
252 Bearing, ball (0899.324)	327 Gear, spur (0899.203)
253 Screw, machine, No. 6-32	328 Ring, retaining
254 Lockwasher	329 Bearing, ball (0899.324)
255 Washer, flat	330 Screw, machine, No. 6-32
256 Screw, machine, No. 6-32	331 Lockwasher
257 Gear, spur, shaft (0899.230)	332 Shaft, pulley
258 Lockwasher	333 Coupler, split hub (0899.345)
259 Screw, machine, No. 6-32	334 Pulley, switch drive
260 Lockwasher	335 Washer, flat
261 Screw, machine, No. 6-32	336 Ring, retaining
262 Lockwasher	337 Screw, machine, No. 6-32
263 Washer, flat	338 Screw, machine, No. 6-32
264 Screw, machine, No. 6-32	339 Post
265 Lockwasher	340 Screw, machine, No. 6-32
266 Screw, machine, No. 6-32	341 Lockwasher
267 Lockwasher	342 Belt (0899.318)
268 Screw, machine, No. 6-32	343 Ring, retaining
269 Lockwasher	344 Shaft, pulley
270 Screw, machine, No. 6-32	345 Gear, interpolator (0899.334)
271 Lockwasher	346 Screw, machine, No. 4-40, ½ in. long
272 Plate, auxiliary gear	347 Nut, machine, 4-40
273 Post	348 Clamp, gear
274 Post	349 Screw, machine, No. 6-32
275 Post	350 Lockwasher
276 Post	351 Screw, machine, No. 6-32
277 Bearing, ball (0899.324)	352 Lockwasher
278 Ring, retaining	353 Screw, machine, No. 6-32
279 Gear, spur (0899.210)	354 Lockwasher
280 Gear, spur, scissor (0899.210)	355 Coupler, split hub
281 Spring, scissor, gear (0899.210)	356 Screw, machine, No. 4-40, ½ in. long
282 Gear, spur scissor, (0899.210)	357 Nut, machine, 4-40
283 Ring, retaining (0899.210)	358 Clamp, coupler
284 Ring, retaining	359 Plate, bearing
285 Bearing, ball (0899.324)	360 Post
286 Bearing, ball (0899.324)	361 Post
287 Ring, retaining	362 Post
288 Ring, retaining (0899.216)	363 Bearing, sleeve (0899.324)
289 Gear, spur, scissor (0899.216)	364 Lockwasher
290 Spring, scissor gear (0899.216)	365 Lockwasher
291 Gear, spur, scissor (0899.216)	366 Bearing, ball (0899.324)
292 Gear, spur (0899.216)	367 Coupler, split hub
293 Pin, roll, taper	368 Screw, machine, No. 4-40, ½ in. long
294 Bearing, ball (0899.324)	369 Nut, machine, No. 4
295 Bearing, ball (0899.324)	370 Clamp, coupling
296 Ring, retaining	371 Screw machine, No. 6
297 Gear, spur, scissor (0899.225)	372 Screw, machine, No. 6-32
298 Spring, gear scissor (0899.225)	373 Lockwasher
299 Gear, spur, scissor (0899.225)	374 Screw, machine, No. 6
300 Ring, retaining (0899.225)	375 Screw, machine, No. 6-32
301 Ring, retaining	376 Belt (0899.322)
302 Bearing, ball (0899.324)	377 Not used.
303 Screw, machine, No. 6-32	378 Not used.
304 Lockwasher	379 Not used.
305 Post	380 Screw, machine, No. 6-32
306 Screw, machine, No. 6-32	381 Lockwasher
307 Lockwasher	382 Not used.
308 Screw, machine, No. 6-32	383 Not used.
309 Lockwasher	384 Screw, machine, No. 6-32
310 Plate B, auxiliary	385 Screw, machine, No. 6-32
311 Post	386 Lockwasher
312 Post	387 Screw, machine, No. 6-32
313 Shaft, gear (0899.197)	388 Lockwasher
314 Bearing, ball, sleeve (0899.197)	389 Not used.
315 Gear, spur (0899.197)	390 Not used.
316 Pin, roll, taper (0899.197)	391 Screw, machine, No. 6-32
317 Bearing, ball (0899.327)	392 Post
318 Ring, retaining (0899.205)	393 Screw, machine, No. 6-32
319 Gear, spur (0899.205)	394 Screw, machine, No. 6-32
320 Spacer (0899.205)	395 Screw, machine, No. 6-32

Figure 134.6 Exciter-monitor main gear train, exploded view—Continued.

396 Screw, machine, No. 6-32
 397 Lockwasher
 398 Screw, machine, No. 6-32
 399 Screw, machine, No. 8-32
 400 Lockwasher
 401 Coupler, split hub
 402 Screw, machine, No. 4-40, ½ in. long
 403 Nut, machine, 4-40
 404 Clamp, coupler
 405 Screw, machine, No. 6-32
 406 Lockwasher
 407 Screw, machine, No. 6-32
 408 Lockwasher
 409 Screw, machine, No. 6-32
 410 Lockwasher
 411 Plate, accessory gear, bearing
 412 Post
 413 Post
 414 Post
 415 Bearing, sleeve (0899.324)
 416 Ring, retaining
 417 Screw, machine, No. 4-40, ½ in. long
 418 Nut, machine, 4-40
 419 Clamp, gear
 420 Gear, spur (0899.191)
 421 Gear, spur (0899.192)

422 Screw, machine, No. 4-40, ½ in. long
 423 Nut, machine, 4-40
 424 Clamp, gear
 425 Ring retaining
 426 Bearing, sleeve (0899.324)
 427 Screw, machine, No. 6-32
 428 Ring, retaining
 429 Screw, machine, No. 6-32
 430 Post
 431 Post
 432 Screw, machine, No. 6-32
 433 Post
 434 Post
 435 Post
 436 Post
 437 Screw, machine, No. 6-32
 438 Screw, machine, No. 6-32
 439 Screw, machine, No. 6-32
 440 Post
 441 Screw machine, No. 6-32
 442 Post
 443 Post
 444 Post
 445 Post
 446 Plate E, auxiliary

Figure 134.6 Exciter-monitor main gear train, exploded view—Continued.

belts and pulley grooves with MIL-G-3278 grease (Esso Beacon 325).

- (107) Refer to paragraph 124 for the replacement procedures.

✓ Page 171, paragraph 127 (as changed by C 1, 16 Oct 61). Delete subparagraphs *c* and *d* and substitute:

c. Stabilized Master Oscillator Calibration Linearity Adjustment. Whenever an oscillator is installed in the exciter-monitor (para 123*b*) or when the oscillator tuning range is no longer covered by the normal travel of its tuning shaft, perform the following procedures:

- (1) Loosen the coupler clamp setscrew located above the stabilized master oscillator (fig. 104) and slide the movable half of the coupler along the shaft to disengage the coupler.
- (2) Turn the LINE switch to ON and allow the oscillator to warm up for at least 1 hour.
- (3) Disable the stabilized master oscillator servo loop by connecting shorting tool Z2603 to test point TP1706 (fig. 105). Clamp the clip lead to the chassis.
- (4) Connect the frequency counter to the 2-4 mc input on stabilized master oscillator rf chassis TP1522 (fig. 139). Energize the exciter-monitor.
- (5) Set METER SWITCH S804 to posi-

tion 2 (MO CONTROL CURRENT), and adjust R1742 (fig. 119) on the error detector subchassis for an exact midscale reading on the meter.

- (6) Set the CHANNEL selector switch to position 1. Unlock the FREQ-MC, BAND, and FREQ-KC controls by turning the associated wingnuts counterclockwise.
- (7) Set the BAND control to the BAND 2 position and the FREQ-MC and FREQ-KC controls for a dial reading of 2.3000 mc.

Caution: Always tighten the three wingnuts on the FREQ-MC, BAND, and FREQ-KC controls after each setting.

- (8) Manually rotate the stabilized master oscillator shaft until the frequency counter indicates an oscillator frequency of exactly 2.0000 mc.

Caution: Do not force the stabilized master oscillator shaft. Although the oscillator has some mechanical over-travel beyond the specified end frequencies, turning the shaft through its endpoint may damage the stabilized master oscillator permanently.

- (9) When the frequency counter indicates an oscillator frequency of 2.0000 mc

for a dial reading of 2.3000 mc on the exciter-monitor, engage the coupler halves (b above).

- (10) Unlock the **FREQ-MC** control, and set for a dial reading of 4.3000 mc. Tighten the wingnut on the **FREQ-MC** control.
- (11) The frequency counter should indicate an oscillator frequency of 4.0000 mc. If it does not, determine the algebraic difference between the actual oscillator frequency and 4.0000 mc. This difference is the endpoint error.
- (12) To determine the frequency shift required to correctly set the endpoint, multiply the endpoint error ((11) above) by 1.33.
- (13) If the endpoint error is less than 1.5 kc, proceed to (14) below. If the endpoint error is greater than 1.5 kc, adjust trimmer L1102 (fig. 124.1) until the frequency change (as indicated on the frequency counter) after passing through 4.0000 mc. equals the frequency shift calculated in (12) above.

For example:

- (a) Assume frequency counter indicates oscillator frequency of 4.0017 mc in (11) above.
- (b) $\text{Endpoint error} = 4.0017 \text{ mc} - 4.0000 \text{ mc} = 1.7 \text{ kc}.$
- (c) Frequency shift required to correctly set the endpoint: $1.7 \text{ kc} \times 1.33 = 2.2 \text{ kc}.$
- (d) Adjust L1102 until frequency counter indicates oscillator is set at 3.9995 mc ($4.0017 \text{ mc} - 0.0022 \text{ mc} = 3.9995 \text{ mc}$).

Note. To gain access to L1102, insert the tip of a thin offset screwdriver into the access hole on the oscillator housing.

- (14) Unlock the **FREQ-MC** control. Set the Control for a dial reading of 2.3000 mc. Tighten the wingnut.
- (15) The frequency counter should indicate an oscillator frequency of 2.0000 mc ($\pm 1.5 \text{ kc}$). If it does not, adjust the calibration adjustment screw (nylon worm), near the front of the master oscillator mounting frame (fig. 104), until the oscillator output is 2.0000 mc.

- (16) Unlock the **FREQ-MC** control, and set for a dial reading of 4.3000 mc. Tighten the wingnut.
- (17) The frequency counter should indicate an oscillator frequency of 4.0000 mc. ($\pm 1.5 \text{ kc}$). If it does not, adjust trimmer L1102 (see note (13) above), until the frequency counter indicates 4.0000 mc.
- (18) Repeat the procedure given in (14) through (17) above until the oscillator frequency is within the specified limits at each end.
- (19) Remove shorting tool Z2603 from TP-1706 in the smo error detector.
- (20) Disconnect the frequency counter from TP1522.

d. Interpolation Oscillator Calibration Linearity Adjustment. Whenever the interpolation oscillator is installed in the exciter-monitor (para 123d) or when the oscillator tuning range is no longer covered by the normal travel of its tuning shaft, perform the following procedures:

- (1) Loosen the interpolation oscillator coupler clamp setscrew located above the interpolation oscillator housing (fig. 104) and slide the movable half of the coupler along the shaft to disengage the coupler.
- (2) Press the **FILAMENT ON** button on the front panel of the power supply control compartment and allow the equipment to warm up for at least 1 hour.
- (3) Disconnect P1003 from J1702 (fig. 104). Connect P1003 and J1702 to two ends of a coaxial T-connector. Connect the frequency counter to the remaining end of the T-connector.
- (4) Set the **CHANNEL** selector switch to position 1. Unlock the **FREQ-MC**, **BAND**, and **FREQ-KC** controls by turning the associated wingnuts counterclockwise.
- (5) Set the **BAND** control on **BAND 2** and the **FREQ-MC** and **FREQ-KC** controls for a dial reading of 2.3999 mc.

Caution: Always tighten the three wingnuts on the **FREQ-MC**, **BAND** and **FREQ-KC** controls after each setting.

DRIVE BELT

41 TEETH

3030-887-860

DRIVE BELT

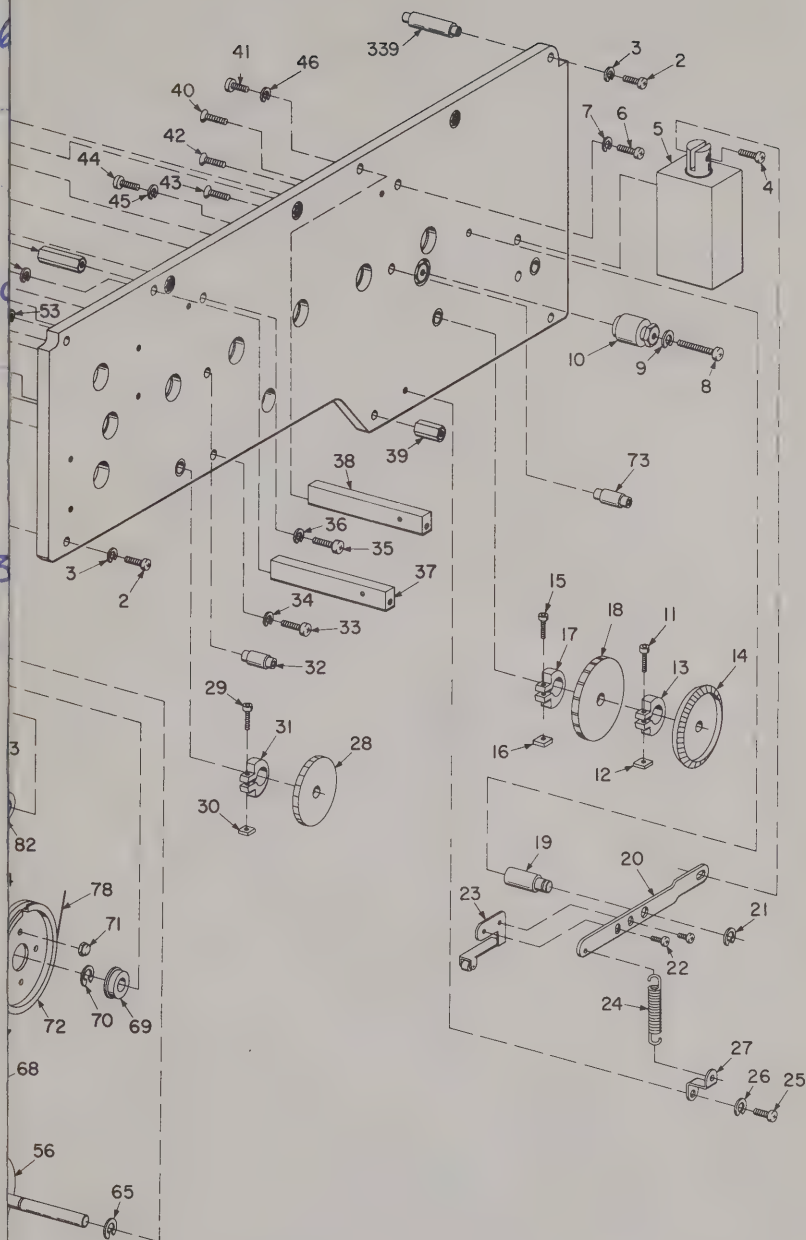
63 TEETH

3030-877-4710

DRIVE BELT

101 TEETH

3030-084-9173



for a dial reading of 2.3000 mc on the exciter-monitor, engage the coupler halves (*b* above).

- (10) Unlock the FREQ-MC control, and set for a dial reading of 4.3000 mc. Tighten the wingnut on the FREQ-MC control.
- (11) The frequency counter should indicate an oscillator frequency of 4.0000 mc. If it does not, determine the algebraic difference between the actual oscillator frequency and 4.0000 mc. This difference is the endpoint error.
- (12) To determine the frequency shift required to correctly set the endpoint, multiply the endpoint error ((11) above) by 1.33.
- (13) If the endpoint error is less than 1.5 kc, proceed to (14) below. If the endpoint error is greater than 1.5 kc, adjust trimmer L1102 (fig. 124.1) until the frequency change (as indicated on the frequency counter) after passing through 4.0000 mc. equals the frequency shift calculated in (12) above.

For example:

- (a) Assume frequency counter indicates oscillator frequency of 4.0017 mc in (11) above.
- (b) Endpoint error = 4.0017 mc - 4.0000 mc = 1.7 kc.
- (c) Frequency shift required to correctly set the endpoint: 1.7 kc \times 1.33 = 2.2 kc.
- (d) Adjust L1102 until frequency counter indicates oscillator is set at 3.9995 mc (4.0017 mc - 0.0022 mc = 3.9995 mc).

Note. To gain access to L1102, insert the tip of a thin offset screwdriver into the access hole on the oscillator housing.

- (14) Unlock the FREQ-MC control. Set the Control for a dial reading of 2.3000 mc. Tighten the wingnut.
- (15) The frequency counter should indicate an oscillator frequency of 2.0000 mc (\pm 1.5 kc). If it does not, adjust the calibration adjustment screw (nylon worm), near the front of the master oscillator mounting frame (fig. 104), until the oscillator output is 2.0000 mc.

- (16) Unlock the FREQ-MC control, and set for a dial reading of 4.3000 mc. Tighten the wingnut.
- (17) The frequency counter should indicate an oscillator frequency of 4.0000 mc. (\pm 1.5 kc). If it does not, adjust trimmer L1102 (see note (13) above), until the frequency counter indicates 4.0000 mc.
- (18) Repeat the procedure given in (14) through (17) above until the oscillator frequency is within the specified limits at each end.
- (19) Remove shorting tool Z2603 from TP-1706 in the smo error detector.
- (20) Disconnect the frequency counter from TP1522.

d. Interpolation Oscillator Calibration Linearity Adjustment. Whenever the interpolation oscillator is installed in the exciter-monitor (para 123d) or when the oscillator tuning range is no longer covered by the normal travel of its tuning shaft, perform the following procedures:

- (1) Loosen the interpolation oscillator coupler clamp setscrew located above the interpolation oscillator housing (fig. 104) and slide the movable half of the coupler along the shaft to disengage the coupler.
- (2) Press the FILAMENT ON button on the front panel of the power supply control compartment and allow the equipment to warm up for at least 1 hour.
- (3) Disconnect P1003 from J1702 (fig. 104). Connect P1003 and J1702 to two ends of a coaxial T-connector. Connect the frequency counter to the remaining end of the T-connector.
- (4) Set the CHANNEL selector switch to position 1. Unlock the FREQ-MC, BAND, and FREQ-KC controls by turning the associated wingnuts counterclockwise.
- (5) Set the BAND control on BAND 2 and the FREQ-MC and FREQ-KC controls for a dial reading of 2.3999 mc.

Caution: Always tighten the three wingnuts on the FREQ-MC, BAND and FREQ-KC controls after each setting.

Drive Belt 324
41 TEETH
3030-887-8669

No. 211
224
376

Drive Belt
63 TEETH
3030-877-4710

Drive Belt
101 TEETH
3030-084-9173

5305-208-3609
4-40-7/8

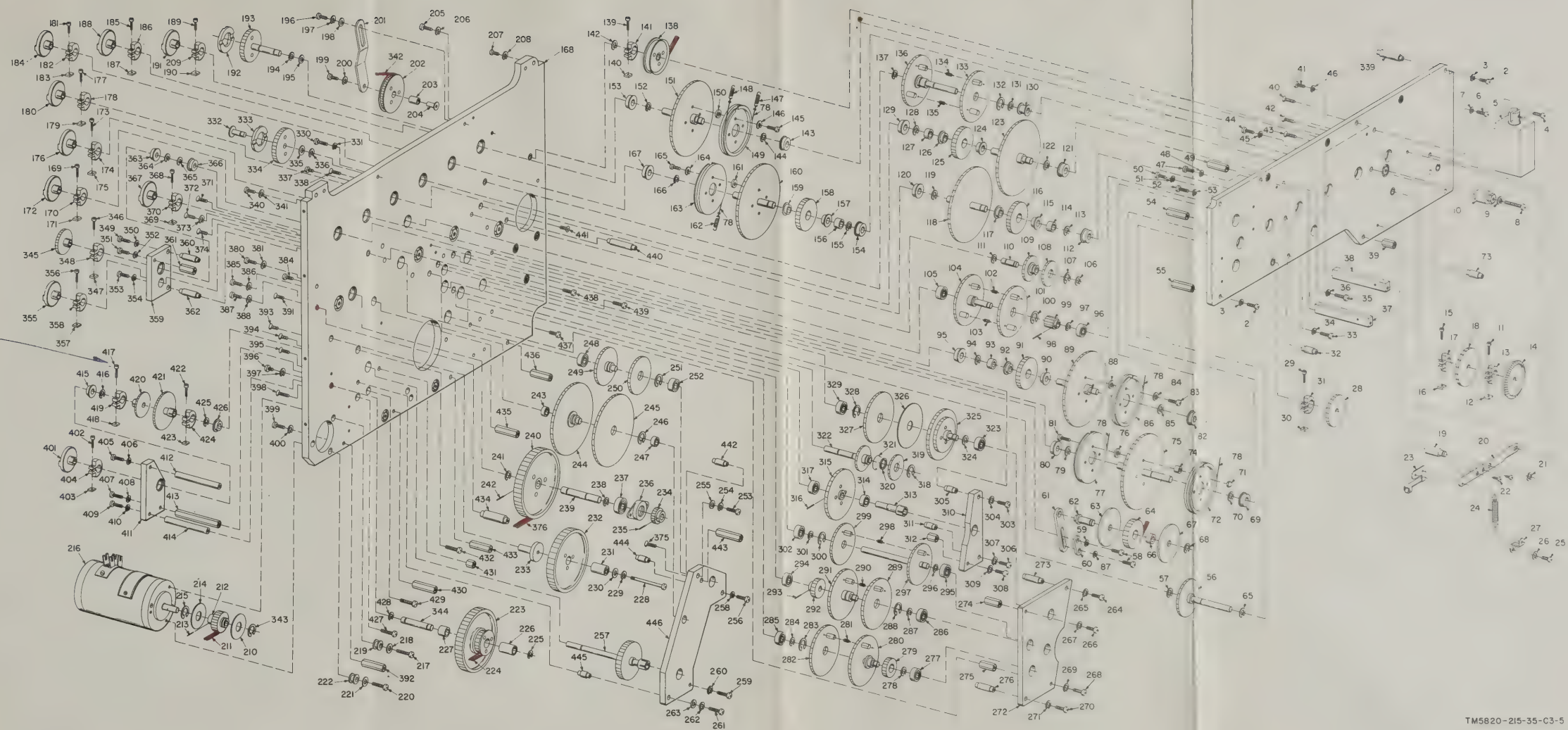


Figure 134.6 Exciter-monitor main gear train, exploded view—Continued.

- (6) Manually rotate the interpolation oscillator shaft until the frequency counter indicates an interpolation oscillator frequency of 350.100 kc.

Caution: Do not force the interpolation oscillator shaft. Although the interpolation oscillator has some mechanical overtravel beyond the specified end frequencies, turning the shaft through its endpoint may damage the interpolation oscillator permanently.

- (7) When the frequency counter indicates an oscillator frequency of 350.100 kc for a dial reading of 2.3999 mc on the exciter-monitor, engage the coupler halves (b above).
- (8) Unlock the FREQ-KC control, and set for a dial reading of 2.3000 mc. Tighten the wingnut.
- (9) The frequency counter should indicate an oscillator frequency of 450.000 kc. If it does not, determine the algebraic difference between the actual oscillator frequency and 450.000 kc. This difference is the endpoint error.
- (10) To determine the frequency shift required to correctly set the endpoint, multiply the endpoint error ((9) above) by 1.5.
- (11) If the endpoint error is less than 50 cps, proceed to (12) below. If the endpoint error is greater than 50 cps, adjust trimmer L1003 (fig. 124.1) until the frequency change (as indicated on the frequency counter) after passing through 450.000 kc, equals the frequency shift calculated in (10) above.

For example:

- (a) Assume frequency counter indicates interpolation oscillator frequency of 450.075 kc in (9) above.
- (b) Endpoint error = $450.075 \text{ kc} - 450.000 \text{ kc} = 0.075 \text{ kc} (75 \text{ cps})$.
- (c) Frequency shift required to correctly set the endpoint = $0.075 \text{ kc} \times 1.5 = 0.1125 \text{ kc}$.
- (d) Adjust L1003 until frequency counter indicates oscillator is set at 449.625 kc ($450.075 \text{ kc} - 0.1125 \text{ kc} = 449.9625 \text{ kc}$).

Note. To gain access to L1003, insert the tip of a thin offset screwdriver into the access hole on the oscillator housing.

- (12) Unlock the FREQ-KC control, and set for a dial reading of 2.3999 mc. Tighten the wingnut.
- (13) The frequency counter should indicate an oscillator frequency of 350.100 kc ($\pm 50 \text{ cps}$). If it does not, adjust the calibration adjustment screw (nylon worm) located near the front of the interpolation oscillator mounting frame (fig. 104), until the oscillator output is 350.100 kc.
- (14) Unlock the FREQ-KC control, and set for a dial reading of 2.3000 mc. Tighten the wingnut.
- (15) The frequency counter should indicate an oscillator frequency of 450.000 kc ($\pm 50 \text{ cps}$). If it does not, adjust L1003 (fig. 124.1) until the oscillator output is 450.000 kc.
- (16) Repeat the procedure given in (12) through (15) above until the oscillator frequency is within specified limits at each end.
- (17) Remove the frequency counter and the T-connector from P1003 and J1702. Connect P1003 and J1702.

✓ Page 180, paragraph 131a, lines 2 and 3 (as changed by C 1, 16 Oct. 61). Delete "when replacing the stabilized master oscillator or."

✓ Page 181, paragraph 131 (as changed by C 1, 16 Oct. 61). Subparagraph a(9). After last sentence add: If the master oscillator frequency is not within the specified limits, perform the oscillator calibration linearity adjustment (para 127c).

✓ Subparagraph a(11). Change TP1502 to TP1522.

✓ Subparagraph b, lines 2 and 3. Delete "when replacing the interpolation oscillator or."

✓ Subparagraph b(1). Add the following after subparagraph (1):

- (1.1) Set the CHANNEL selector switch to position 1.
- (1.2) Turn the wingnuts on the FREQ-MC, BAND and FREQ-KC counter-clockwise.

(1.3) Set the BAND control to BAND 2 and set the FREQ-MC and FREQ-KC controls for a dial reading of 2.3999 mc.

(1.4) Turn the three wingnuts clockwise to lock controls.

Subparagraph b(2), line 5. Change 450.0 to 350.1.

Subparagraph b(3). After last sentence add: If the oscillator frequency is not within the specified limits, perform the interpolation calibration linearity adjustment (para 127d).

Page 192, figure 142. Make the following changes to the legend: Item 5, after Locking wingnut add 0899.173.

Item 14, after Stop ring shaft assembly add includes 0899.126, 0899.145, 0899.123, and 0899.139.

Item 16, after Drive shaft assembly add 0899.163.

Page 193, figure 141. Delete figure 141 and substitute new figure 141.

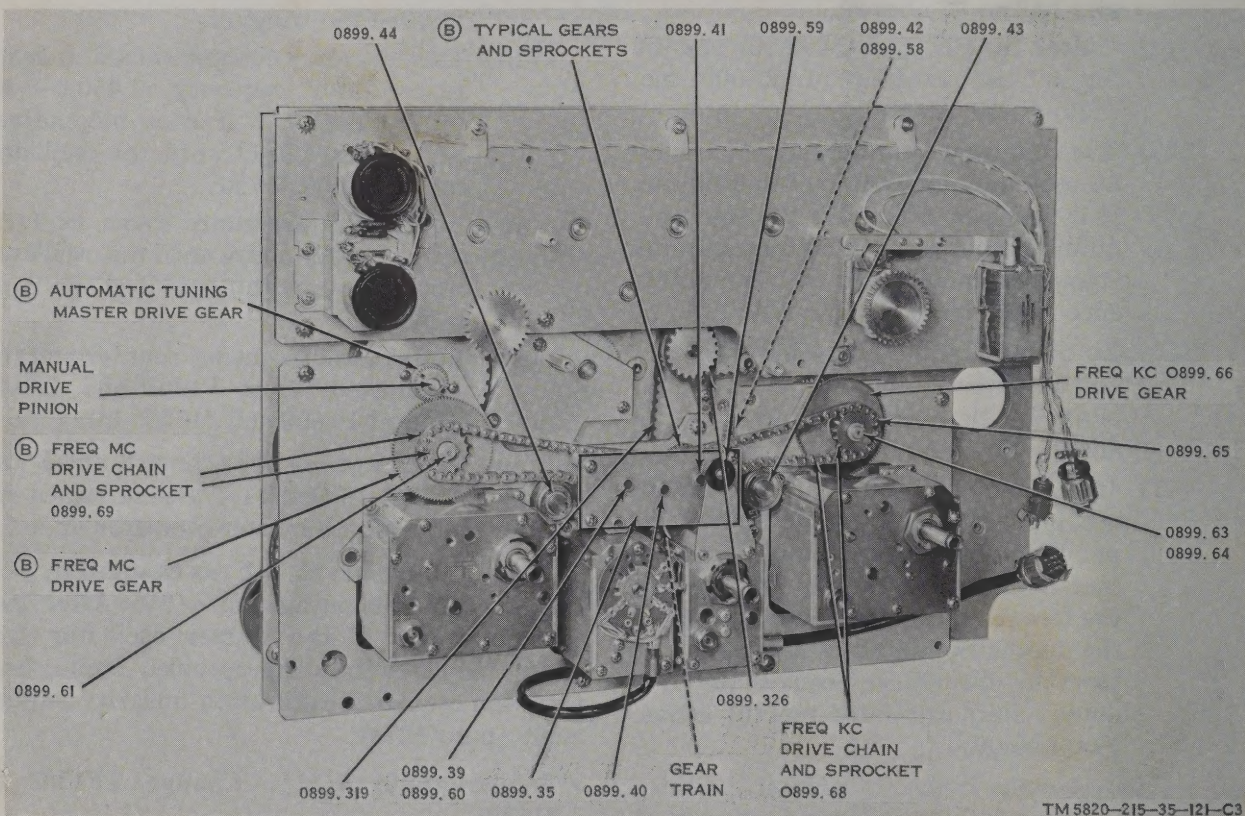


Figure 141. (Superseded) Automatic tuning drive mechanism, lubrication and gear identification.

Page 196, figure 144. Add the following to the legend: Item 3, after Wingnut add 0899.-119.

Item 12, after Stop ring shaft assembly add (includes 0899.78).

Page 200, figure 147. Delete figure 147 and substitute new figure 147.

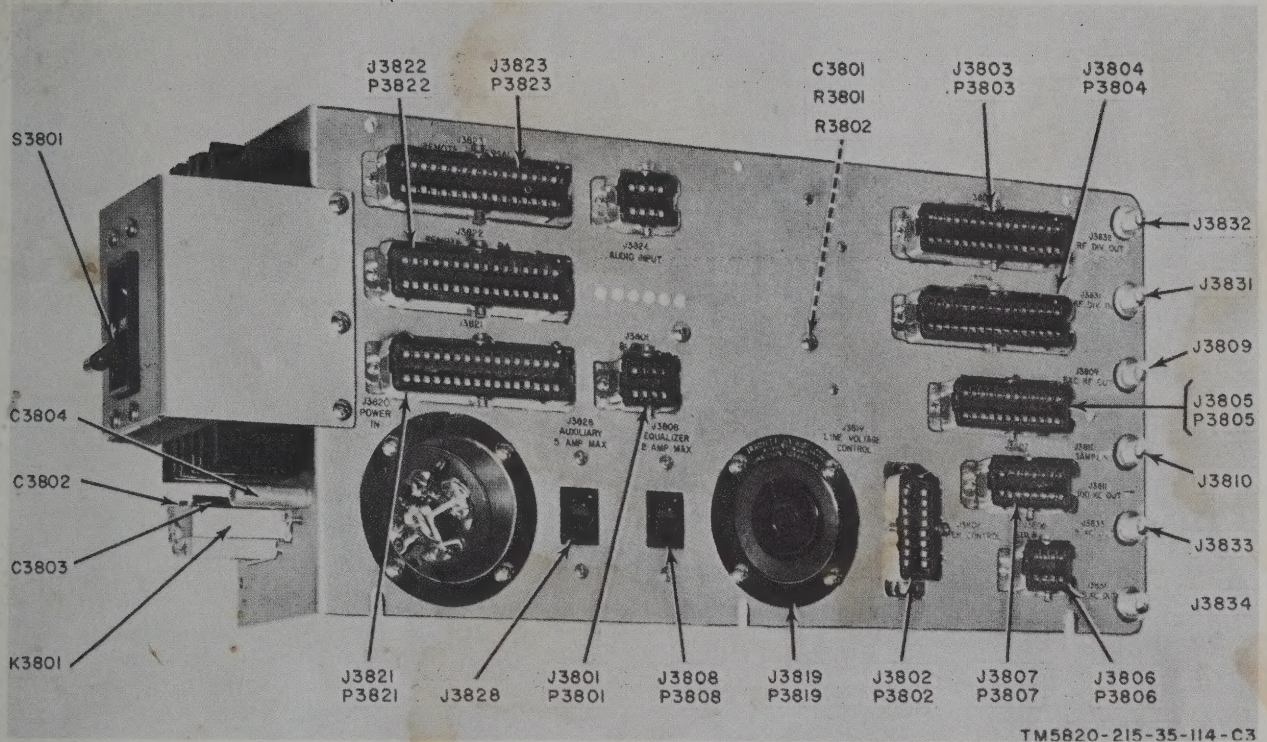


Figure 147. (Superseded) Main junction box.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

USASA (2)
CNGB (1)
CC-E (7)
Dir of Trans (1)
CofEngrs (1)
TSG (1)
CofSptS (1)
USAARENBD (2)
USACDCEA (1)
USACDCCBRA (1)
USACDCCEA (1)
USACDCCEA:
 Ft Huachuca (1)
USACDCOA (1)
USACDCQMA (1)
USACDCTA (1)
USACDCADA (1)
USACDCARMA (1)
USACDCAVNA (1)
USACDCARTYA (1)
USACDCSWA (1)
USAMC (5)
USCONARC (5)
ARADCOM (5)
ARADCOM Rgn (2)
OS Maj Comd (4)
LOGCOMD (2)
USAMICOM (4)
USASTRATCOM (4)
USAESC (70)
MDW (1)
Armies (2)
Corps (2)
USAC (3)
Sve Colleges 2;
USAGCS (5)
USAFSCS (5)
USAAADS (2)
USAAAMS (2)
USAAARMS (2)
USAIS (2)
USAES (2)
USATC Armor (2)

USATC Engr (2)
USATC Inf (2)
USASTC (2)
WRAMC (1)
Army Pic Cen (2)
USACDCEC (10)
Instls (2) except
 Ft Gordon (10)
 Ft Huachuca (10)
 Ft Carson (21)
 Ft Knox (12)
Gen Dep (2)
Sig Sec Gen Dep (5)
Sig Dep (12)
A Dep (2) except
 LBAD (14)
 SAAD (30)
 TOAD (14)
 LEAD (7)
 SHAD (3)
 NAAD (5)
 SVAD (5)
 CHAD (3)
 ATAD (10)
Sig FLDMS (2)
AMS (1)
USAERDAA (2)
USAERDAW (13)
USACRREL (2)
Units org under fol TOE:
 (2 copies each)
 11-57
 11-97
 11-98
 11-117
 11-127
 11-155
 11-157
 11-158
 11-500 (AA-AC)
 11-587
 11-592
 11-597

NG: None.

USAR: None.

For explanation of abbreviations used, see AR 320-50.